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BIRD-BANDING

A JOURNAL OF ORNITHOLOGICAL INVESTIGATION

VOL. XXVI APRIL, 1955 No. 2

STUDIES OF A TREE SWALLOW COLONY
(Third Paper)

BY LAWRENCE B. CHAPMAN

The study of a Tree Swallow *(Iridoprocne bicolor)* colony has continued at my home in Princeton since my two previous papers were published (Chapman 1935 and 1939). This study has now covered a period of 22 years and I am summarizing in this paper some of the observations made and the data collected.

The area occupied by the nest boxes from 1938 to 1953 was approximately 10 acres (4 hectares), varying somewhat from year to year. The number of nest boxes available each year is shown in Table I.[1]

A curve showing the number of breeding pairs is given in figure 1. In 1934 and 1935 nine additional boxes were located around the main colony varying from ¼ to ¾ miles away; in 1936 there were four such boxes. The solid line in figure 1 includes these extra boxes and the dotted line in figure 1 shows the number of breeding pairs with these boxes omitted. It will be seen from figure 1, that the cold southern winter of 1939-40 when many Tree Swallows were reported killed in the south (Christy 1940, Weber 1940) had no influence on the number of nesting pairs in the Princeton colony in 1940.

The first Tree Swallows arrive in the nesting area usually around April 1 and the first eggs are laid between May 19 and 25 which gives a pre-egg period of about 50 days. Most of the swallows have completed their nesting and have left the colony by July 1. Only when nests have been broken up and the birds lay a second clutch of eggs, are there any swallows in the nesting area after the first few days in July.

I have not been at the colony during May and most of June except during week ends; hence no attempt has been made to collect data on the incubation period or the time that the eggs hatch. Data on the incubation period and the time the nestlings are in the nest are given by Austin and Low (1932: 40-43).

RETURNS OF BIRDS BANDED AS ADULTS

Table II gives data for 22 years covering the banding and the return to the colony of swallows banded as adults the previous year. Table III gives data on the returns of birds breeding the previous year in the colony.

[1]Data for the years 1931-1937 is given in *Bird-Banding*, **10**: 71

TABLE I—SUMMARY OF TREE SWALLOW DATA

	1938	1939	1940	1941	1942	1943	1944	1945	1946	1949	1950	1951	1952	1953
1. Number of boxes available for Tree Swallows, House Wrens and Bluebirds	37	36	41	43	44	42	39	45	46	46	46	46	45	45
2. Number of boxes occupied by Tree Swallows	20	20	18	17	25	25	24	20	15	26	29	21	25	30[11]
3. Number of boxes occupied by Bluebirds	3	5	1	1	2	3	2	1	2	2	1	2	1	2
4. Number of boxes occupied by breeding House Wrens while Swallows were nesting[4]	0	1	0	0	2	5	6	4	5	3	7	3	3	3
5. Percentage of boxes occupied by Tree Swallows, Bluebirds and House Wrens	62.0	72.2	46.3	42.0	68.5	78.5	79.5	55.5	48.0	69.5	80.5	56.5	64.5	77.8
6. Percentage of breeding Swallows, *banded previous year* known to have returned[3]	20.0	53.4	31.5	14.3	50.0	41.7	40.0	6.7[5]	21.5	27.8	46.7	0[7]	54.8	48.2
7. Number of nestling Swallows banded previous year which returned	1	0	1	1[8]	2	2	1[4]	0	0	—[9]	2[8]	0	0	5[8]
8. Percentage of nestlings banded previous year which returned	1.2	0	2.4	—	3.3	2.3	—	0	0	—	2.7	0	0	5.05
9. Number of eggs laid	106	104	94	84	125	131	—	104	67	129	140	107	128[10]	158
10. Percentage of eggs hatched	86.0	92.5	44.7	84.5	88.8	73.3	—	—	—	62.0	71.5	62.5	79.0	80.3
11. Percentage of nestlings which died in nest boxes	52.8	13.5	64.2	15.5	20.7	41.7	—	—	—	8.8	—[7]	44.7	3.95	10.2
12. Number of nestlings leaving nest boxes	43	83	15	60	88	56	40	12+5[6]	41	73	4	37	97	114
13. Reproductive efficiency	40.5	79.7	15.9	71.5	70.3	42.7	—	16.3	61.2	56.5	2.9[7]	34.6	75.8	72.0
14. Eggs per clutch—average of colony	5.30	5.20	—	4.95	5.00	5.25	—	—	—	4.95	4.82	5.10	5.12	5.10

For banding years 1931-1937, see *Bird-Banding* **10**: 71

Blank spaces indicate data incomplete

For footnotes, see page 47.

Footnotes to Table I

[1]Usually several ♂ House Wrens without mates in the colony area (Table VII)

[2]See Table III for return of Swallows *breeding* previous year

[3]Banded in 1939; not trapped in 1940

[4]A 1942 nestling

[5]See notes in text regarding season of 1945

[6]12 in first nestings, 5 in second

[7]See remarks in text regarding visit of raccoon

[8]One disappeared and did not nest

[9]No nestlings banded in 1947 and 1948

[10]Excludes second nesting in Box 14 (see text)

[11]♀ in Box 4 disappeared after laying 4 eggs. A second ♀ laid a new clutch of 5 eggs. Both sets are included, making 31 nestings.

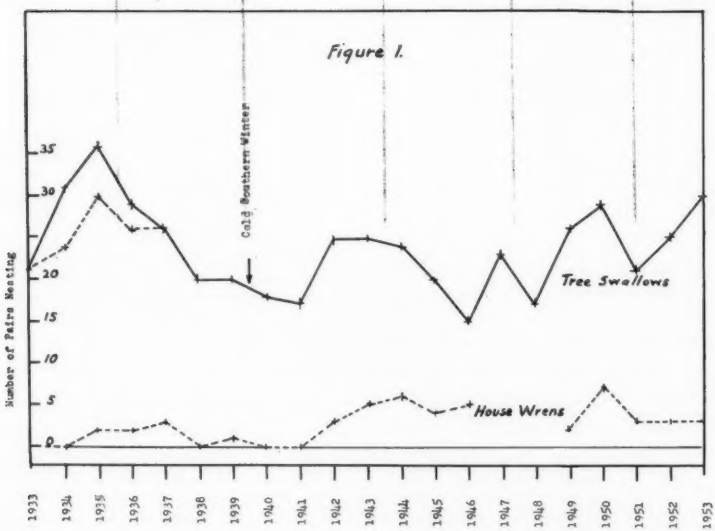

TABLE II

RETURNS OF ADULTS BANDED PREVIOUS YEAR
(Banding Years 1931-1952; Breeding Years 1932-1953 inclusive)

Banding Year	Breeding Adults Banded in Colony	Nestlings Banded and Fledged	Adults Banded Previous Year Which Returned[1]	Nestling Returns	% Adults Returns Banded Previous Year
1931	2	7	—	—	—
1932	21	48	2	1	100.0%
1933	28	61	11	1	52.3%
1934	37	148	11	4	39.3%
1935	26	125	22	3	59.5%
1936	12	64	7	2[3]	26.9%
1937	15	86	8	3	66.7%
1938	15	43	3	1	20.0%
1939	19	83	8	0	53.4%
1940	14	15	6	1	31.5%
1941	20	60	2	1	14.3%
1942	24	88	10	2	50.0%
1943	10	56	10	2	41.7%
1944	15	40	4	1	40.0%
1945	14	17	1	0	6.7%
1946	(15)	(41)	3	0	21.5%
Total	272	941	108[2]	22[3]	
1947	14	0	6	0	40.0%
1948	18	0	6	—	42.9%
1949	30	73	5	—	27.8%
1950	28	4	14	2[4]	46.7%
1951	31	37	0	0	0%
1952	29	99	17	0	54.8%
1953	27	114	14	5[4]	48.2%

[1]All did not return the next year. Five failed to make a Return-1. These five birds are recorded here as returning the next year, however, as they made a Return-2's.

[2]Excludes one non-breeding adult return.

[3]One found dead in nest box; hence 21 return breeders.

[4]One disappeared and did not breed.

Of the 272 adults banded in the colony for the fifteen-year period 1931-1945 (Table II), 108 returned to breed at least once in the colony. This gives an average percentage of adult returns of 39.6%.

The 272 adults banded in the colony were made up of 116 males and 156 females. The returns of birds banded as adults in the colony were made up of 51 males and 57 females (a total of 108 as stated in the notes under Table IV). Hence the return percentages by sexes were as follows:

Males $\frac{51}{116} = 43.0\%$ Females $\frac{57}{156} = 36.5\%$

TABLE III

RETURNS OF ADULTS BREEDING PREVIOUS YEAR
(Breeding Years, 1932-1946 inclusive)

	1	2	3	4	5	6
Breeding Year	Number of Breeding Birds	Return Breeders[1]	Colony Nestlings Breeding for First Time	Total Previously Banded Birds (Col. 2 & 3)	New Unbanded Breeders[3]	Adults not Banded
1931	(8)	—	—	—	—	6
1932	26	2[2]	1	3	23	2
1933	42	12	1	13	29	1
1934	62	18	4	22	40	3
1935	72	37	3	40	32	3
1936	58	25	1	26	32	19
1937	52	22	3	25	27	7
1938	40	15	1	16	24	8
1939	40	17	0	17	23	3
1940	36	7	1	8	28	12
1941	34	8	1	9	25	2
1942	50	19	2	21	29	2
1943	50	26	2	28	22	9
1944	48	23	1	24	24	10
1945	40	6	0	6	34	21
1946	30	8	0	8	22	—
Totals	680	245[4]	21	266	414	108

[1]Includes colony nestlings and birds banded by Dr. Kraus, *after* their first breeding year in the colony.

[2]Two adults banded in 1931.

[3]Includes birds banded by Dr. Kraus breeding for *first* time in the colony. May included colony breeders of previous years that were not trapped and banded.

[4]Returns = 245 + 2 trapped during 1948 and 1949 = 247 return breeders.

An analysis of the 680 swallows breeding in the colony during the years 1932-1946 inclusive (Table III) shows the average make-up of the colony as follows:

Return breeders of previous year $\frac{245}{680} = 36.0\%$

New birds $\frac{414}{680} = 60.9\%$

Birds banded as nestings in the colony $\frac{21}{680} = \frac{3.1\%}{100.0\%}$

Table III shows that during this fifteen-year period, 108 adults, mostly males, were not trapped. This is 15.9% of the breeding birds.

If we assume that one-third of these non-banded swallows returned as breeders the next year, the percentage of return breeders would be 41.3% instead of 36.0% and the percentage of new birds would be 55.6% instead of 60.9%.

Another summary of the returns of banded adults is given in Table IV. The designations of Return-1, Return-2, etc. (as explained in the footnote of Table IV) indicate the age of the bird from the time of its first nesting; hence the age of some of these Tree Swallows can be noted.

TABLE IV

15-Year Summary of Tree Swallow Returns

(Banding years 1931-1945, inclusive; Breeding years 1932-1949)

Adult Return—1[1]	122[2]	(56 ♂ and 66 ♀)
Adult Return—2	65	(34 ♂ and 31 ♀)
Adult Return—3	30	(17 ♂ and 13 ♀)
Adult Return—4	18	(11 ♂ and 7 ♀)
Adult Return—5	7	(3 ♂ and 4 ♀)
Adult Return—6	3	(1 ♂ and 2 ♀)
Adult Return—7	1 ♀	
Adult Return—8 (Breeding 9 times)	1 ♀	
Total	247	

Notes on Table IV

[1]In the records of my banding station, a bird is recorded as a Return—1, if it returns the next year after banding. If it returns the second year after banding it is recorded as a Return—2, even if I fail to trap it the year following banding. Birds banded as adults and missing a year in nest trappings *but appearing in the colony in a later year were as follows:*

Failing to make a Return—1	4 ♂ and 1 ♀
Failing to make a Return—2	2 ♂
Failing to make a Return—3	4 ♂
Failing to make a Return—4	2 ♂

[2]122 swallows were trapped the year following their first nesting. The number of birds returning at least once to breed in the colony a second time was 127, made up of 122 Return—1's and five birds which failed to make a Return—1 but were trapped as breeders in the colony the second year after their first nesting. These 127 birds were made up of 108 banded as adults in the colony, 10 banded as nestlings in the colony and breeding a second time and 9 birds banded by Dr. Douglas L. Kraus or outside of the colony and breeding more than once in the colony.

The above table includes two birds banded as adults before 1945, trapped breeding after 1946, one in 1948 and one in 1949.

Probably some of the males listed above failing to make a Return—1, a Return—2, a Return—3 or a Return—4 were breeding in the colony in the year they were missed but were not trapped. Males can usually be trapped only when they enter the nest box to feed the young. Hence if a nest is broken up or deserted before the eggs hatch, the male is generally not trapped. Only a very few males have been trapped in April when they are first selecting a nest box.

Probably my designation, Return—4, for example, actually does indicate a bird which has bred five times, for the two males which failed to be recorded as a Return—4, no doubt were breeding in the colony but were not trapped for the reason stated above.

PERCENTAGES OF EGGS HATCHED, NESTLING MORTALITY AND REPRODUCTIVE EFFICIENCY

Table I gives data on the percentage of eggs hatched, percentage of nestlings dying in the boxes and the reproductive efficiency for the years 1938 to 1953, with the exception of the years 1947 and 1948. Data for the years 1931-1937 are given in Chapman 1939:71. Omitting the year 1950, which is discussed later in the paper, the percentage of eggs hatched for thirteen breeding years varied from 44.7% to 92.5%; the nestling mortality varied from 4.0% to 64.2% and the reproductive efficiency varied from 15.9% to 79.7%.

Table V gives a summary of the above data for 12 years in which careful counts were made of eggs laid and hatched in the various nest boxes. This table shows that the average percentage of eggs hatched was 79.5, the average nestling mortality was 24.6, and the average reproductive efficiency was 60.0.

TABLE V

Summary of Results for 12 Years in which count was made of eggs laid and hatched.

Year	Nests	Eggs Laid	Eggs Hatched	Fledglings Leaving Nests
1933	21	118	108	61
1934	31	176	158	148
1935	36	175	155	125
1938	20	106	91	43
1939	20	104	96	83
1940	18	94	42	15
1941	17	84	71	60
1942	25	125	111	88
1943	25	131	96	56
1949	26	129	80	73
1951	21	107	67	37
1952	25	128	101	97
Totals	285	1,477	1,176	886

Average eggs per nest—5.2
Average no. of fledglings raised per pair—3.11
Average percentage of eggs hatched—79.5%
Average nestling mortality—24.6%
Average reproductive efficiency—60.0%

The above average percentage of eggs hatched (79.5%) compares favorably with the results of other Tree Swallow colonies and other hole-nesting species as given in the very complete table in Allen and Nice (1952:640). The average reproductive efficiency or nesting success of 60.0%, however, is low. The cause of this is discussed later under the Effects of Weather.

It is interesting to compare the above percentages with those published for Tree Swallows by Weydemeyer (1935), Kuerzi (1941), Low (1934), and Winn (1949).

Weydemeyer's summaries for eight years of breeding Tree Swallows on a ranch in northwestern Montana are:

Nests with eggs	52
Percentage of eggs hatched	98.5%
Nestling mortality	3.8%
Reproductive efficiency	94.7%

Weydemeyer reports that no nestlings died in the nest boxes. The 12 which failed to be fledged in the eight-year period were taken by Sparrow Hawks. Weydemeyer's swallows in a number of cases had second broods. The above data are for the first broods only.

Kuerzi with a much larger number of swallows breeding per acre than at Princeton, had a very favorable site on the bank of the Housatonic River in Connecticut. His average results for a 3-year period are:

Number of nests	68
Percentage of eggs hatched	72.1%
Nestling mortality	2.4%
Reproductive efficiency	70.5%

Low's results for a colony on Cape Cod for a period of 3 years are:

Number of nests	290
Percentage of eggs hatched	83.6%
Nestling mortality	41.0%
Reproductive efficiency	49.3%

Winn gives the following results for one season at Kent Island, New Brunswick:

Number of nests	22
Percentage of eggs hatched	94.6%
Reproductive efficiency	87.8%

During the fifteen-year period 1931-1945 there were 329 nestings and 941 nestlings were successfully fledged. This gives an average of 2.86 nestlings fledged per nest. For the combined years 1952 and 1953, which were exceedingly good breeding years, the number of nestlings fledged per nesting was 3.76.

WANDERING FEMALES AND WANDERING MALES

In my second paper (Chapman 1939), I reported seven cases of "wandering females" that were trapped in a subsequent season nesting several miles from their previous nests. During the seasons 1939-1953, eleven additional cases have been discovered of females nesting a second season from one to 20 miles from the previous nest. The fact that 36.5% of the banded females return to breed a second year as against 43% of the males, would appear to indicate that the number of females which wander off in this manner is not large.

Six of these wandering females were exchanged between the Chapman and Kraus[1] colonies, which were four miles apart. One female was found breeding 3¼ miles away, one was 1½ miles away and one was one mile away. Unfortunately the color of these females was not always recorded when they were first trapped, but in three cases

[1]See *Bird-Banding*, **6**: 51

where a notation was made they were brown birds, i.e. breeding for the first time.

In 1951, one of my nesting females (46-8727), a bright blue bird nesting for the first time in the colony, deserted its nest with three unhatched eggs and one dead nestling around June 16, after three days of rainy weather. This bird was trapped by Mr. William Wharton on June 19th nesting in his colony in Groton, Mass., 20 miles away.

Also in 1951, I trapped a female (42-95835) on May 27 breeding in one of my nest boxes. This bird was banded by Mr. Wharton in 1947 and bred in his colony in 1947, 1948, 1949 and 1950 (Wharton 1952:30). This bird was at least 5 years old. It was not trapped in my colony in 1953.

As no breeding males have ever been exchanged between the Kraus and Chapman colonies, and as none of my breeding males had been recovered elsewhere up to 1938, I was inclined to believe that all the breeding males returned the next season to the same colony, frequently to the same or a nearby nest box. However, two cases have occurred to show that this is not the case. Male (41-47112) breeding in the colony in 1942 failed to return in 1943 and on June 1, 1944 was trapped breeding in a box one mile away. Male (47-8765) breeding in the colony in 1952 failed to return in 1953 and was found dead on June 10, 1953 15 miles S by W of Princeton.

Von Haartman (1949:22) who has done intensive research with the Pied Flycatcher *(Muscicapa hypoleuca)*, another hole nesting species, on an area of 1.5 square miles (3.9 square kilometers) in Finland, gives some interesting data on the return of this bird to its nesting area. Banding data covering 7 years show that 70 males out of 189 banded as adults (37.0%) returned to the nesting area and nineteen females out of 177 banded as adults (10.7%) returned to the nesting area. The return of males varied in different years from 29.2% to 55.5% and the best return for females was 16.9%. While his average return of adults over the 7-year period, of 24.3% is considerably less than the 39.6% for my Tree Swallows, his data show that the females of the Pied Flycatcher are more given to changing breeding areas than the female Tree Swallows. In another paper by Von Haartman (Farner 1950:22), he considers some females breed every year in the same territory *("ortstreue")* and others are "nomadic" and change their breeding place from year to year.

Trettau and Merkel (1943) in studying this same species in Silesia had much smaller returns—males 19.6% and females 21.7% (see Von Haartman 1949:42-43), with the males and females return nearly equal. However, in a later study of this species in Hessen, Trettau (1952) (see Nice 1953) had a return of 37.5% from 40 nesting females and a return of 35.1% from 37 males.

RECOVERIES OF SWALLOWS BANDED AS NESTLINGS

Between 1931 and 1952 inclusive, 1,195 nestlings were banded in the colony. Forty-four of these have been recovered as follows: 26

TABLE VI

BIRDS BANDED AS NESTLINGS RECOVERED OUTSIDE OF COLONY

(1931-1946)

Band No.	Sex	Date Banded	Place of Recovery	Distance from Colony	Date of Recovery
H69737	♀	6/12/33	Kraus Colony	4 miles SE	1934
H80137	♂	6/10/34	Kraus Colony	4 miles SE	1936*
L68636	♂	6/ 8/34	Kraus Colony	4 miles SE	1936*
L73116	♂	6/15/34	Kraus Colony	4 miles SE	1936*
L73132	♂	6/15/35	Kraus Colony	4 miles SE	1936
34-72134	♀	6/15/34	Kraus Colony	4 miles SE	6/18/37*
39-62252	♂	6/18/39	Kraus Colony	4 miles SE	6/12/41*
40-96585	♀	6/15/42	Kraus Colony	4 miles SE	6/15/46
F76375[1]	—	6/22/32	Lodi, N. J.	160 miles SE	8/ 3/32
H80178[1]	—	6/17/33	Uncasville, Conn.	70 miles S	8/14/33
H80148[1]	—	6/12/33	New Ipswich, N. H.	21 miles N	6/34
L68611[2]	—	6/10/34	Hubbardston, Mass.	4 miles W	4/28/38
37-67743[1]	♀	6/16/37	Princeton, Mass.	3 miles SE	6/ 7/38
42-77922[3]	—	6/27/43	S. Gardner, Mass.	9 miles NNW	5/20/45
39-62282[1]	—	6/18/39	Gilbertsville, Mass.	18 miles SW	5/30/44

*Nested again at Kraus Colony the year following recovery

[1]Dead

[2]Flew against store window "fighting with another bird"

[3]"Found"

breeding in the colony; 3 non-breeders in the colony; 8 breeding at the Kraus colony, 4 miles southeast and 7 elsewhere as listed in Table VI. This gives a total recovery percentage of 3.7% and a return to the colony of 2.4% of those banded.

Of the birds banded as nestlings *recovered* just before or during the breeding season, 69.0% were trapped in the colony. This percentage agrees well with Allen and Nice's (1952:654) percentage of 61% for the Purple Martin *(Progne subis)* recovered within one mile of the birthplace and with the other species given in Allen and Nice's table.

The distribution of the recoveries is as follows:

Returned to colony (16♂ : 13♀)	29
Recovered on first southward migration	2[1]
At Kraus colony, 4 miles SE (5♂ : 3♀)	8
21 miles N (June)	1
9 miles NNW (May)	1
4 miles W (April)	1
18 miles SW (May)	1
3 miles SE (June)	1
Total	44

Among the nestlings returning to the colony were two from the same brood—one nesting in the nest box where she was hatched and the other in an adjacent nest box.

[1]See *Bird-Banding*, **6**:56

One of the most interesting recoveries of Tree Swallows banded in Princeton was a nestling banded by Douglas L. Kraus in 1942, which was recovered dead in East Lebanon, Maine, on June 18, 1945. Lebanon is 90 miles northeast of Princeton. It is quite evident from the date of recovery that this bird was breeding in Maine when it was killed. The northeast flight line taken by this swallow was in general parallel to the coast.

It is interesting to note that the only two Bluebirds *(Sialia s. sialis)* banded as nestlings in my colony and recovered elsewhere (Chapman 1942) also took a northeasterly course. One was recovered breeding at Groton, Mass. (20 miles northeast), the following June and the other was recovered in July in Maine, 300 miles northeast of Princeton when 5 years old.

Data are available on 44 birds banded as nestlings either in the Kraus or Chapman colonies which later nested in the Chapman colony or were banded in the Chapman colony and later nested in the Kraus colony. The breeding behavior of these birds is as follows:

Males breeding for first time when one year old	10
Males breeding for first time when two years old	14
Females breeding for first time when one year old	16
Females breeding for first time when two years old	4

No doubt a few of the two-year-old males were breeding when one year old and failed to be trapped, for, as pointed out later, males are not as readily trapped as females. However, the data appear to indicate that some males do not breed until two years old while most of the females breed when one year old.

Table III shows that during the period 1932-1946, 60.9% of the swallows breeding in the colony were new unbanded birds or birds banded at the Kraus colony and breeding in my colony for the first time. Many of these new birds must be one-year-old females or one-year- or two-year-old males. This high percentage of new birds together with the small number of returns of colony nestlings, indicate that many of the swallows banded as nestlings move off to other areas the next season.

It has been hoped that some fall recoveries would be obtained of swallows banded as nestlings in order to learn whether they dispersed in various directions in the fall and thus perhaps locate areas for nesting the next season. Boyd and Thomson (1937:280) give data on the fall dispersal of eleven fledglings of the European Barn Swallow *(Hirundo r. rustica)* ranging from one to 24 miles. Some went to the north (24 miles) some to the east (20 miles) and some to the southwest (23 miles). Similar fall movements for the same species are shown by Drost and Desselberger (1932). Allen and Nice (1952:650) mention the recovery of a fledgling Purple Martin 8 miles northeast, 3 weeks after it was banded. The only two recoveries of Princeton fledglings taken the same year that they were banded were to the south. (Table VI.)

In the middle of July 1952, two pairs of Tree Swallows were nesting in an open field (Boxes 14 and 36) after all the other swallows had left the colony. From the 18th to the 29th of July a group of immature Tree Swallows was observed flying around this field and appeared

greatly interested in the boxes occupied by the two nesting pairs. Many of the immature swallows flew up to the entrances of the boxes and looked in and several entered box no. 14 and other nearby empty nest boxes. They were evidently birds of the year dispersing from other breeding areas. As only a few pairs were known to be nesting in the vicinity of the colony, it is assumed that these young birds were hatched some distance away. By means of the shutter on box 14 and automatic shutters on other boxes, fourteen were trapped and banded over a period of 12 days. Two were taken in box 14 after the nestlings had flown.

As these swallows showed so much interest in the various nest boxes, it was hoped that some of them would return and breed the next year. However, none of them were found in the colony in 1953, although all but 5 of the breeding birds and 25 non-breeding swallows were trapped and banded.

A few other cases have been noted in past years of a single immature swallow appearing in the colony and in one case one entered a nest box in which nestlings were being fed. Low (1933:81) reports three cases of immature Tree Swallows entering nest boxes in this manner. One was an unbanded bird and the other two were from nest boxes a half-mile to the southwest which they had left about 10 days earlier.

EFFECTS OF WEATHER ON BREEDING TREE SWALLOWS

As a rule the percentage of eggs hatched each year has not varied widely, ranging between 73% and 92%, with exception of three years (1940, 1949 and 1951). The conditions causing the low percentage of eggs hatched in 1940 will be discussed in detail later in this section.

The nestling mortality on the other hand has varied widely from year to year as shown in Table I. The number of nestlings dying in the nest boxes is almost directly dependent upon the weather and consequently on the amount of insect food available when the young birds are being fed in the nests.

As pointed out in an earlier paper (Chapman 1935:45), the location of the Princeton colony is in a very unfavorable ecological region for breeding Tree Swallows and apparently the real attraction for the birds is the large number of nest boxes available. In cold and rainy weather, because of the large number of breeding Tree Swallows in an unfavorable area, the birds have great difficulty in finding a sufficient number of flying insects to feed themselves and their young and hence cold rainy spells have often resulted in heavy nestling mortality and low reproductive efficiency. In a few cases bad weather in early spring has resulted in a lower percentage of the eggs hatched. A discussion of the nestling mortality due to bad weather is given in my two former papers (Chapman 1935:40 and 1939:65) and will not be enlarged upon here. Koskimies (1950:45) points out that the combination of rain and cold weather is also most fatal to the European Swift *(Micropus apus)* and indicates (p. 40) that feeding ceases at a temperature of 12°C (53.6°F). He also mentions the almost complete disappearance of the swifts from the colonies in bad weather.

Extremely bad weather in 1940 in late May and early June and

again in late June had an adverse effect on both the incubation period and the feeding period and makes this year worth discussing briefly. In 1940 the swallows began laying about May 19 and by the 24th egg laying was well underway. From May 20 to 26, it was cold with rain or fog much of the time and the wind was northeast. On May 30 it was evident that some of the nests were temporarily deserted and several pairs of swallows had left the colony. It seems apparent that during this cold and rainy spell, the swallows had to spend so much time hunting for insects (a great deal of it away from the area) that incubation ceased in several of the nests. Droppings on top of several boxes contained seeds which apparently were bayberry *(Myrica Carolinensis)*, indicating the scarceness of insect food.

During the cold drizzle of May 26, two pairs of swallows were observed flying back and forth between their own nest boxes and adjacent empty nest boxes. It appeared that each of these pairs was planning to nest again in one of the adjacent boxes. However, neither of these pairs nested again in new boxes. In one of the original nest boxes, a new nest was built and 6 eggs laid on top of one already containing 3 eggs. The other nest, which had been deserted for nearly a week with 5 eggs in it, was lined with white feathers and 4 new eggs added. On June 9 this nest contained 9 eggs, only 4 of which hatched.[1]

The net result of this spell of bad weather in 1940 was as follows:

Pairs without eggs which disappeared	4
Pairs with eggs, which deserted	2
New nests built on top of old ones	2
Nest with eggs added after temporary desertion	3
Nest in which laying did not begin until after rainy spell	4
Nest in which incubation continued	7
	22

On May 19 there were 22 pairs in the colony; on June 9 there were only 16 pairs. Of the 7 nests in which incubation continued, two were later robbed of the eggs and in the remaining five only 52% of the eggs hatched.

Another cold and rainy spell occurred during June 23 to 26 when the nestlings were being fed. On June 25 the temperature was around 50°F nearly all day. Very few swallows were seen flying over the colony. On this day one nest was under observation for twenty minutes and neither adult entered the box during this time.

In 1940 the percentage of eggs hatched was 44.7—the lowest in the colony's history. The nestling mortality was 64.2%, one of the highest, and the reproductive efficiency was 15.9, the lowest with the exception of the year 1950 when all the boxes except one were cleaned out by a raccoon. Twelve nests (67%) of the 18 which originally contained eggs were total failures.

It is interesting to note that Allen and Nice (1952:637) report that 1940 was also a disastrous year for Purple Martins at the George Reserve where 12 pairs showed a nesting success of only 17.5% due

[1]This female was 6 years old and eventually nested nine times in the colony.

largely to the same weather conditions experienced at Princeton.

On May 1, 1953 there was a hard driving rain all morning with an easterly wind and a temperature close to 32°F. and in the afternoon there was a light cold drizzle. On May 2 the wind was still easterly with a temperature close to 32°F. with a drizzle much of the day. No Tree Swallows were at the colony on either day.

At the home of C. Thomas Crocker, about one mile from the colony, about 100 swallows were observed on May 1 at 7 P.M.—some sitting on the electric light wires and others close together on the feeders and bird boxes. Many of these birds had their wings half spread. An investigation the next afternoon in the neighborhood where these swallows were seen the afternoon before, resulted in finding around 300 Tree Swallows, in a brushy pasture in which grew many bayberry bushes *(Myrica carolinensis)*. Some groups were sitting on rocks, other groups were sitting on bushes and low trees and many were feeding on bayberries. Other groups were sitting on the wires along the road but only a few were flying around. On returning to my colony at 5:30 P.M., a few swallows were seen flying into the area during a cold rain and to enter some of the nest boxes. An inspection was made of 5 nest boxes. Three were found empty. In one, three swallows were found and in another, five. Of these 8 swallows, one was found later breeding in another box in the colony. The other seven were not seen again. These two boxes were empty at 7:30 P.M., the birds probably being disturbed by my banding. One of the swallows found in the nest box with four others was a bird (probably a male) banded on April 30, 1950 and not seen again until trapped on May 2, 1953.

It is impossible to account for the large number of swallows seen in the bayberry patch on May 2, as not more than one-third of these are believed to nest in the vicinity. As discussed later, May 1 appears too early for the arrival of the secondary flight of young swallows.

It was still cold and rainy on May 3 and there were no swallows in the colony nesting area but around fifty were still in the bayberry patch referred to above.

It is quite evident that Tree Swallows are able to take care of themselves during cold rainy spells by feeding on bayberries and hence when this food is available they do not suffer the mortality experienced by Purple Martins as discussed by Allen and Nice (1952:648) and by Forbush (1929:314) for the year 1903, and by other swallows caught north in bad weather in early spring.

Burleigh (1942:120) mentions that during the cold winter of 1939-40 in Mississippi, Tree Swallows were concentrated in enormous numbers where the thickets of myrtle bushes fringed the salt marshes.

However, Tree Swallows do not appear to be able to keep nestlings alive during bad weather by feeding them bayberries, although as pointed out above there is evidence that the adults fed to some extent on bayberries during bad weather when there were nestlings in the nest boxes. There are a great many bayberry bushes in the area adjacent to the colony.

As pointed out in an earlier paper (Chapman 1935:46) and by Kuerzi (1941:8) and others, Tree Swallows do not usually appear at the colony on cold and windy days in April and early May. If

they do appear it is only for a brief period early in the morning. My records for April 1, 1953 with the thermometer at 38°F, showed swallows present at 6 A.M. but all gone from the area at 10 A.M. Swallows were present on the mornings of April 3 to 8 but usually all had disappeared by noon. On April 14, there were nine inches of snow on the ground and no swallows were at the colony.

No information is available as to where the swallows go during the cold and cloudy days. Apparently the nesting urge diminishes by noon and the birds go to other areas where there is a greater concentration of aeroplankton. Quite probably they go to feed over lakes and ponds where the warmer air temperature due to the body of water would increase the number of flying insects, as pointed out by Koskimies (1950:45). It is evident from Glick (1939:94) that Tree Swallows can obtain little insect food at a temperature below 40 or 50°F.

It is interesting to note that Sheppard (1933:181) states that the Oriental Swallows *(Hirundo savignii)* disappear from the villages and towns in the territory around Jerusalem during periods of wet and stormy weather and go to the Jordan Valley where it is much warmer and insect life is abundant.

No adverse effects of hot days on the nestlings have been observed. On July 20, 1949 when the temperature in the shade under the nest box was 90°F. at 2 P.M. and a thermometer resting on the cover of the nest box containing 2 nestlings registered 110°F., the temperature inside of the box was 97°F. This box was painted gray and was 7/8" thick. On July 31 the temperature inside of the box at 3 P.M. was 104°F. The two nestlings were fledged successfully.

An analysis of the behavior of the 48 banded birds (32 ♀ and 16 ♂) involved in 32 complete nest failures showed the following:

females returning to colony to breed	3	(9.4%)
females not returning	29[1]	(90.6%)
males returning to colony	5	(31.0%)
males not returning to colony	11	(69.0%)

Six of the males were observed at the nest boxes and not trapped and 10 were not observed or nest failure occurred before the males could be trapped.

OTHER CAUSES FOR REDUCED NESTING SUCCESS

Three other factors which have had an adverse influence on the nesting success of the Tree Swallows, have been House Wrens *(Troglodytes a. aédon)*, Protocalliphora larvae [Apaulina] and ants.

From one to seven House Wrens have bred each year in the colony and in addition there are sometimes one or more unmated males each of which builds cock nests in one or more nest boxes. These wrens did not molest the Tree Swallows except in one case up to 1939 (see Chapman 1939:70). Table VII gives the number of Tree Swallow eggs apparently destroyed by House Wrens for an eight-year period.

In 1939, there was one pair of wrens breeding in the colony and one unmated male. On May 27 the eggs in two adjacent Tree Swallow

[1]One female was trapped two years later, breeding at the Kraus colony, 4 miles away, classing her as a "wandering female."

nest boxes and in two adjacent Bluebird *(Sialia s. sialis)* nests were punctured and thrown out and on June 2, the eggs were thrown out from a third swallow's nest box. On June 2 a cock wren nest was found in one of these boxes. An unmated male wren was observed singing around these five nest boxes and on June 2 he was trapped and released at considerable distance from the colony. He did not return and there was no further destruction of eggs. It seems evident that this unmated male had been the cause of all this egg destruction. The three pairs of swallows immediately laid new clutches of eggs but the two pairs of Bluebirds deserted.

One bluebird egg was left unpunctured in one of the nest boxes and later a pair of Tree Swallows took possession and laid a clutch of five eggs in the deserted Bluebird's nest. The Bluebird's egg hatched along with the five swallow's eggs and the nestling developed at about the same rate as the swallows but it died when about half fledged.

Observations during subsequent years seem to indicate that the unmated male wrens are guilty of much but not all of the egg destruction. As is evident from Table VII, egg destruction is usually higher with an increase in the number of nesting wrens. The destruction of eggs by wrens seems to vary among individuals, some being especially destructive and others apparently not molesting the swallows at all. There have been a number of cases where young nestlings have been thrown out by the wrens and a male wren's nest started in the nest box the same day.

Protocalliphora larvae [Apaulina] have been found in most of the nest boxes each year and some boxes have been heavily infested (Chapman 1939:70). However, in recent years the number of larvae have been much less than in the early period of the colony and seldom have any been found attached to the nestlings in the past eight years.

In May 1938 a short article appeared in the *Technology Review* entitled "Do Flies Shun Blue?" This article pointed out that from observations made in France and elsewhere, the common house fly appeared to avoid rooms in which the walls were painted ultramarine or "implement" blue. This led to the idea that if the nest boxes were painted blue, the protocalliphora flies might not enter and hence the

TABLE VII

INTERFERENCE WITH NESTING BY HOUSE WRENS

Year	1941	1942	1943	1946	1949	1950	1952	1953
Pairs of Tree Swallows	17	25	25	15	26	29	25	30
Pairs of breeding House Wrens	0	2	5	5	3	7	3	3
Apparent number of male Wrens	1	3	5	8	6	7	4	6
Percentage of eggs apparently destroyed by Wrens	0	1.6	9.2	17.9	30.2	6.5	0	3.2
Percentage of nests broken up by Wrens	0	4.0	16.0	20.0	30.8	6.9	3.7	3.2
Percentage of Tree Swallow eggs hatched	84.5	88.8	73.3	—	62.0	71.5	79.0	80.3

trouble with the larvae could be obviated. Consequently a number of boxes were painted wagon blue before the 1939 breeding season. A careful count of larvae and pupae in 18 boxes was made and Table VIII gives the results of this experiment. It is obvious that the color of the box had no influence on the number of protocalliphora larvae, in fact the nest box painted blue inside and out had the highest count. Blue boxes were also experimented with at the Wharton Banding Station in Groton, Mass., and it was found there also that the blue color of the nest boxes had no influence (Mason 1944:242).

Ants and their eggs have occasionally been found in the nest boxes, sometimes while the nestlings were in the nests but more frequently after the nestlings have left. The year 1945 was an especially bad one and in several boxes which contained eggs or nestlings, hundreds of ants and ant "eggs" were found in the bottom of the boxes and throughout the hay making up the nest. The nestlings in all cases did not seem to be molested until the nest material was stirred up and then the ants attacked the nestlings. In each case the ants were destroyed and a new hay nest was made in the nest box. Dr. Charles H. Blake identified two species in two boxes as *Crematogaster lineolata*, and *Tapinoma sessile*, and a third as a *Myrmica sp.* in a third box. In 1951, three nestlings in one box were eaten by black ants of an undetermined species but larger than the brown ants found in 1945.

Mrs. Laskey (1940:186) mentions Bluebird nestlings in 3 boxes eaten by tiny ants *(Solenopsis sp.)* in Tennessee and Mrs. Thomas (1946:161) mentions ants occasionally found in Bluebird nest boxes in Arkansas.

TABLE VIII

PROTOCALLIPHORA COUNTS (1939)

Box No.	Species	Color of Box	Larvae and Pupae
2	T.S.	Brown	12
3	T.S.	Brown	17
7	T.S.	Gray	3
8	T.S.	Brown	22
9	T.S.	*Blue*	0
14	Bluebird	Brown	0
16	T.S.	*Blue*	48
17	Bluebird	*Blue*[1]	121
18	T.S.	Gray	2
19	Bluebird	*Blue*	59
20	T.S.	Gray	42
22	Bluebird	Gray	61
33	T.S.	Gray	16
36	T.S.	Gray	35
38	T.S.	Gray	0
39	T.S.	Gray	0
47	T.S.	Gray	32
48	T.S.	Gray	54

[1]Blue inside and out

TABLE IX

EGG DATA FOR NINE FEMALES

Breeding Year	F-96736	H-80104	40-96504	47-8704	43-48018	34-72143	41-47027	46-8717	46-8737
1	6[4]	6[4]	4[2]	*[3]	4[2]	5[4]	6[4]	4[4]	5[3]
2	5	5	5	5	*	5	6	7	5
3	6	4	5	4	5	6	2	6[7]	5[7]
4	6	*	7	5	5	6	6		
5	*	5	5	5	5	6	6		
6	—	2 & 4[5]	6	5 & 4[6]	—	5 & 4[5]	—		
7	—	—	*	7[7]		6			
8			—			6			
9						4			

*No data available.

[1]Brown bird; hence a nestling of previous year.

[2]Dull blue bird.

[3]Bright blue bird.

[4]Color not recorded.

[5]First laying of 2 eggs robbed.

[6]This bird had 2 broods—5 eggs in first nesting and 4 in second.

[7]Breeding in 1953.

[8]Season of 1940 a wet cold season. 5 eggs laid and nest temporarily abandoned and then 4 more eggs laid, making 9 in all. 4 hatched.

A RACCOON'S VISIT TO THE COLONY

In 1950 a raccoon or more probably a family of raccoons entered the colony and destroyed 26 of the 29 Tree Swallow nests and in addition seven nests of House Wrens and one Bluebird nest. House Wrens destroyed two Tree Swallows' nests and the net result of the season was only one successful nesting with 4 nestlings leaving the nest box. The raccoon raid resulted in the taking of at least 6 adult female Tree Swallows, 85 nestlings and 13 eggs, besides the nestlings and eggs of the House Wrens and Bluebirds. Only three of the swallows breeding in the colony returned in 1951. These three were breeding again in the colony in 1953. Three nests were found empty on the morning of June 17 and on the morning of June 22, sixteen more nests were empty. Hence in five nights 54 good-sized nestlings were taken. On June 25, ten more nests were empty. In the case of the 6 adult females killed, the wings or wing feathers were found on the ground at the foot of the pole. No doubt other females were also eaten. The raccoon was not seen but the signs at and about the nest boxes left no doubt that one or more raccoons was the cause of this disaster.

The season of 1945 was also a disastrous one either due to a cat or a raccoon, with a nesting success of only 16.3%.

EGG DATA

The number of eggs laid and hatched was not recorded every year. Table V gives data for the eggs laid and hatched for 12 years with average data computed from the table. In a few cases where egg counts were not made early in the season, a record was made at the time of hatching of the number of nestlings and the unhatched eggs in each box, to obtain data on the number of eggs laid. This method may be open to question but it is not believed that Tree Swallows remove unhatched eggs from the nests.

Kuerzi (1941:25) gives the average eggs per set for 417 pairs over a three-year period as 5.2. This is exactly the same as the average for the 12-year period in the Princeton colony.

TABLE X

EGGS LAID BY BIRDS BANDED PREVIOUS YEAR AS NESTLINGS

	Breeding Year	Eggs	Color of Female
H80122	1934	5	——
L68640	1935	3	——
L73107	1935	4	——
41-47045	1942	6	Greenish
41-47134	1943	5	Brown
43-48116	1950	4	Brown
46-52916	1953	5	Dull Blue
47-8759	1953	6	Greenish-Brown

TABLE XI

EGGS PER NEST FOR 6 YEARS

	1939	1943	1949	1951	1952[1]	1953
No. of nests with 2 eggs	0	0	1	0	0	0
3 eggs	2	2	1	2	3	3
4 eggs	1	4	7	2	2	3
5 eggs	9	9	9	9	11	13
6 eggs	7	7	7	8	7	9
7 eggs	1	2	0	0	2	2
8 eggs	0	1	0	0	0	0
9 eggs	0	0	1	0	0	0
No. of nests	20	25	26	21	25	30
Eggs laid	104	131	129	107	128	154

[1]Second nesting of one pair not included.

Table IX gives the egg data for successive breeding years for nine females that returned to breed three or more times. Table X gives data for eggs laid in the first breeding year by swallows banded as nestlings.

NOTES ON BEHAVIOR

In 1953 observations were made on the time of arrival and the behavior of the one-year-old brown females. The first adults arrived in the colony on March 29 but the first brown female was not seen until April 24. A one-year-old male was trapped on April 23, and two others were trapped on May 11. Brown females were trapped at the nest boxes as follows:

April 30-May 10	4
May 11-16	7
May 19-31	10
June 6-21	5

An attempt was made to trap the brown females each day; hence the above data is representative of the arrivals of these females. These dates agree generally with the secondary flight noted by Kuerzi (1941:7) and also with Shelley's remarks regarding the arrival of brown females in New Hampshire (Shelley 1935:34).

The arrival of the brown females causes considerable trouble in the colony, as they frequently attempt to enter boxes which are already taken by mated pairs. Frequently fights take place between the mated female and the newly arrived intruding brown female. Practically all of the fights at the nest boxes appear to be between the two females. As far as could be observed the males take no part in these fights.

Each year a considerable number of the brown females disappear from the colony after being trapped and banded although a good number secure mates and nest. In 1953 a careful watch was made and as many as possible of these year-old females were trapped with automatic shutters and banded. Eleven out of twenty-five brown females

disappeared without attempting to nest. In addition to these twenty-five brown females, there were five classed as dull blue or dull greenish, all of which nested.

In 1953 two females were found together in the same nest box on May 12, a brown one on top of a dull green one. The brown female disappeared and the other swallow nested in this box.

In 1950 and again in 1953 an attempt was made to trap as many swallows as possible early in the season. Many of these birds were color-banded. The following tabulation shows the subsequent behavior of birds most of which were trapped before May 15.

	1950	1953
New ♀ ♀ moving to a second box before nesting	2	2
New ♂ moving to a second box before nesting	0	1
New ♀ ♀ trapped and disappeared	8[1]	14
New ♂ ♂ trapped and disappeared	5[2]	0
New birds (sex unknown) trapped and disappeared	3	4
Nestlings of previous year which disappeared	2 ♀	1 ♂
Nestlings of previous year which nested	1	4
Returning ♀ disappearing after trapping	0	1
Returning ♀ ♀ moving to a second box before nesting	7	1
Returning ♂ moving to a second box before nesting	0	1
New ♀ ♀ nesting in box where first trapped	9	18
New ♂ ♂ nesting in box where first trapped	4	7

In a few cases the determination of the sex of the birds which disappeared may be in error.

[1]In two cases attempts to nest were broken up by House Wrens.
[2]In one case attempt to nest was broken up by House Wrens.

The behavior of the breeding males varies considerably. Some go readily into the nest box as the incubating females leave and "stand watch" looking out of the hole during the absence of the female. Frequently these males call as they approach the box and the female flies out. Other males do not enter the box in this manner but sit on a nearby perch. Most males enter the box to feed the young. Usually they hesitate a second before entering but the female enters at once. As the females are generally banded while incubating, this behavior of the males noted above allows the watcher to distinguish the males from the females, and the males can thus be trapped with a pull string and the female is not usually trapped a second time. A few males enter the nest box only after long intervals and then usually they have a great many insects in their beaks. In one case where a count was made, a male had 67 green aphis and small flies. In a few cases males do not enter the box to feed the young and hence cannot be trapped. No case has come under observation where the male incubated the eggs.

Some males sing and try to encourage the female to enter the nest box when they have been disturbed by banding operations. Two males have been trapped during incubation when they flew into the box with a feather.

In two cases, once in 1935 and again in 1938, a male was trapped several times in two adjacent nest boxes. As only one male was seen in either case, apparently these were definite cases of polygyny.

PAIR FORMATION

In 1953, I was present at the colony when the Tree Swallows arrived and full notes were kept for each day in April and much of May on the behavior of the birds at some of the nest boxes. Many of the swallows were color-banded.

From these observations it is quite apparent that few, if any, of the swallows arrive at the colony as mated pairs. Pair formation appears to be such a confusing affair, with birds visiting back and forth between different boxes, that no worthwhile conclusions can be drawn.

It was decided to concentrate attention at one nest box and box no. 7 was selected for this purpose. The data collected at this nest box from April 1 to June 10 can be briefly summarized as follows. Most of the trapping at this box was done by means of an automatic shutter.

♂ ♂ trapped and later found breeding in another box	2
1952 ♂ nestling trapped and disappeared	1
Bright blue ♀ trapped and disappeared	1
Brown ♀ ♀ trapped and disappeared	2
Dull blue ♀ trapped and found nesting in another box	1
Trapped and disappeared (sex unknown)	4
Breeding ♂ trapped June 17 (1st seen April 27)	1
Breeding brown ♀ trapped May 11	1

The nest was started on May 23 and had five eggs on May 31.

How much of the behavior at this nest box was normal pair formation and how much of it was caused by trapping and banding activities it is impossible to say.

THE PAIR BOND

One of the facts which I wished to obtain from this study was whether there is a definite pair bond between any of the swallows from year to year. As the following data show, there are numerous cases of swallows remating for two or more seasons and also numerous cases of "divorce." Many believe that when two birds remate at the same nest box in a second season, it is merely because the male and female return to the same nest site and hence meet there and consequently remate. However, the banding data show that there are a number of cases where birds have remated a second time and nested in a different but nearby nest box in a subsequent season.

In fourteen breeding seasons at the Princeton colony which I have selected for analysis, 67 pairs which were mated the previous year returned to breed again in the colony. The remating behavior of these 67 pairs is as follows:

Remating in the same nest box	22	31.8%
Remating in a nearby box	12	17.9%
Divorces	33	49.3%

The above summary includes the data on 4 pairs that were mated three times and one pair that was mated four times. Four of these five pairs changed the nest box once and one pair nested in the same box three times. Hence the above data are based on 56 pairs.

There was one pair which mated for two seasons and was divorced the third season. Another pair was mated in 1942 (Box 4), divorced in

1943 and remated in 1944 (Box 4).[1] I suspect that in 1943 the female returned too late and the male mated with a female which arrived earlier. In addition to the 33 divorces there was one case where the female of a pair which was mated in 1952, returned in 1953 and deserted after being trapped. One female (H-80101) nested in the same box for 5 years, two years with one mate, and 2 years with a second mate. The first and second pair bonds were broken as the males failed to return.

During the fall of 1938, nest box no. 17 was moved to a new location 50 ft. away and was replaced at its old location by a new box. The pair of swallows which nested in no. 17 in 1938 remated in 1939 in no. 17 at its new location, evidently preferring the old box rather than a particular location.

The behavior of two pairs of swallows which definitely appear to have pair bonds deserves special discussion. One pair (46-8733 ♂ banded in 1951 and 47-8704 ♀ banded in 1947), nested in box 14 in 1951, the male being a new bird that year and the female a Return-4, hence at least 5 years old. This female had nested the three previous seasons in box 25 and her first season in no. 4. The mate of box no. 4 is not known but for each nesting in no. 25 she had a different mate, none of which returned the following season. In 1951 she moved to box no. 14. This pair which nested in no. 14 in 1951 nested again in the same box in 1952. In 1953 a pair of Bluebirds had possession of box no. 14 when this pair of swallows arrived. Although the swallows tried hard to secure this nest box, they were driven off by the Bluebirds. Finally on April 29, I put up another box, 54 feet from no. 14 which was immediately taken by this pair. In 1952 this pair had two broods in box no. 14—the only case of a pair of Tree Swallows having two broods in the 22 years of the colony's history.

The other interesting case of pair-bond is 34-72143 ♀ and 36-18650 ♂. Data on this 9-year-old female are given in Table XII. She mated with 36-18650 for three and possibly four years. This pair nested in box no. 11 in 1940 and nested in a nearby box in 1941 and 1942. The male was not trapped in 1943 although the female was again back at the same box.

It is interesting to note that this male, previous to the mating discussed above, had 36-18636 ♀ for his mate in 1938 and 1939, yet they nested in different (nearby) boxes in 1938 and 1939. His mate of 1939 did not return in 1940 and he moved to a third box (no. 11) and mated with 34-72143 ♀ who had lost her mate of two years in 1940.

A pair (F-81853 ♂ and H-80104 ♀) was mentioned in my 1939 paper. This pair mated in box no. 1 in 1933, 1934 and 1935. In 1936 they moved to an adjacent nest box (no. 2) and were mated again. The male did not return in 1937 but the female was back in no. 2 in 1937 and 1938 with a new mate each year.

It would appear from the cases given above that a pair bond may exist between certain pairs of Tree Swallows and remating at times may be more than merely arriving again at last year's nest box and hence remating.

[1]This remating is not included in the above data, this pair being listed as divorced.

TABLE XII

HISTORY OF FEMALE 34-72143—A NINE-YEAR-OLD SWALLOW

		Nest Box	Eggs	Mate	Age of Mate
Banded in	1935	9	5	34-72140	1
Return	1936	52	5	not trapped	—
	1937	17	6	35-50782	2[2]
	1938	11	6	36-18523	2[3]
	1939	11	6	36-18523	3
	1940	11	5 & 4[1]	36-18650	3[4 5]
	1941	16	6	36-18650	4
	1942	16	6	36-18650	5
	1943	16	4	not trapped	—

[1]A rainy season—see notes under Weather

[2]A 1935 nestling

[3]A 1936 nestling

[4]Trapped breeding the colony in 1938

[5]1939 mate did not return.

Laidlaw Williams (1952:26) in his study of the Brewer Blackbird *(Euphagus cyanocephalus)* gives cases of definite pair bond with this species, although this bird is polygynous. He points out that out of 70 primary matings, in 45 cases both members of the primary pair returned the following year. Of these 45 possibilities for remating, there were 42 rematings (93.3%) and only 3 divorces. Some of these pairs maintained the bond for several years—one pair for five years. The Brewer Blackbird in his study-colony was found to be non-migratory and pair formation takes place while the birds are in the flock. However, these birds did not remain mated during the non-breeding season and the male and female do not meet at the nest location of the previous year.

Kendeigh (1941:55) gives two cases in which pairs of House Wrens remated for three years. One pair nested for three years in the same box. The second pair nested in the same box for two seasons and in a box about 230 ft. away in the other season. This second pair remained together for the second nesting of each season.

Richdale (1947:115) in his study of the Yellow-eyed Penguin *(Megadyptes antipodes)* shows that the pair bond is strong in many birds of this species, as 82% of the mated pairs which returned remained intact for the second season.

Richdale also points out that certain of the burrow nesting petrels also remate and Lockley (1942) states that some of the Manx Shearwaters remate for one or more seasons. However, in the case of the petrels and shearwaters the birds meet again at the previous nest site like the Tree Swallows.

Richdale (1947:115) points out that birds of the above type do not fit into either Lack's (1940:270) class 4 (sexes that remain together for one breeding season) or class 5 (birds that pair for life) and

believes a new category should be established to include species which remain mated for some years but in which class divorces exist. Such a classification might include the Tree Swallows.

Since this paper was written, data for the 1954 breeding season have been obtained. Six pairs which were mated in 1953 returned in 1954. There were three cases of remating and three divorces. Of special interest is the fact that ♀ 47-8704 (8 years old) and ♂ 46-8733 returned and remated again in Box 14. This pair has thus been mated for four seasons, three times in the same nest box and once (1953) in an adjacent box. The female was trapped on April 24.

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GENERAL NOTES

Fighting and Mortality among Tufted Titmice *(Parus bicolor)* caught in Banding Traps near Leesburg, Virginia.—Early in the winter of 1953-1954, I had six all-purpose traps in operation at my banding station. During this period fourteen Tufted Titmice were banded. In addition, all three Titmice banded the previous winter returned. That Titmice may not get along well together when confined in the same enclosure was indicated by an observation on November 8, 1953. On making my rounds I found in one trap two Tufted Titmice locked in a furious struggle. Fighting took place on the ground, in the air and on the sides of the trap. One of the birds appeared to be getting the worst of it. On my intervention it flew to the side of the trap and remained there in a dazed condition. I noticed that one eye was partially closed. Both birds were unbanded. The unhurt bird was given band number 21-192634. The injured bird was given band number 21-192635.

On November 28, 1953, I found evidence of a very bitter struggle. A Tufted Titmouse flying about a trap was found to be 21-192638, a bird banded on November 14, 1953. After releasing this bird, I noticed a Tufted Titmouse lying prone in a corner of the trap. With its head almost buried in a shallow depression the bird, to all appearances, was dead. But in my hand it made a faint struggle to get away. It was 21-192627, banded on October 30, 1953. One eye was closed and nearly every feather had been plucked from its head. After a few hours in captivity the bird was able to fly away. It was not retaken, and my guess is that it died of its injuries.

During the Christmas season I left my traps open with grain in them. Visiting the traps on January 2nd, 1954, I found in one a dead Tufted Titmouse. This was 21-192640, banded on December 8, 1953. The bird had obviously been killed in a struggle similar to those I had previously witnessed. The entire head was bloody and devoid of feathers. There was a distinct hole through the cranium behind the eye.

On renewing banding activity on January 3rd, I discovered a new instance of Titmouse strife. A trap which had been empty at 1:00 P.M. contained four live Tufted Titmice and one dead one when revisited at 2:00 P.M. The freshly killed bird, 21-192639, had been banded on November 14, 1953, and had repeated frequently since then. Three of the four live birds in the trap escaped before I could examine them. The single bird I examined wore band number 21-192630. It was uninjured and to my knowledge had not been involved in any previous fights. The dead bird, as usual, had had its head plucked of feathers. An autopsy revealed that the bird was a female. The cranium was clotted with blood and had been punctured behind the eye. From the degree of cranial ossification it appeared that the bird was an immature. This was the last case of mortality or injury to come to light during the winter banding season.

Mr. Seth Low, banding near Leytonsville, Maryland, tells me he has found injured Tufted Titmice in his traps. He had been under the impression that the injuries were self-inflicted, but, in the light of my experience, thinks his birds might well have injured themselves through fighting.—John V. Dennis, Rt. 1, Box 376, Leesburg, Va.

The Life History of an Ohio Chimney Swift Recovered in Tennessee.—On September 19, 1954, Clive E. Smith captured a chimney swift from the Purse Building in Chattanooga which bore band number 42-188588. This bird was a male which was at least six years old and had been banded in Ohio where he lived and nested each summer since he was first trapped. Following is an account of his life history.

No. -88 was first captured on May 28, 1949, from air shaft E1 on the roof of Kent Hall on the campus of Kent State University. He was with the mates of that shaft (42-196909 and 42-196921), whose nest was about three-fourths made on that date, and another bird (42-188573) which was a return. These two visitors did not remain there. However, in the night of July 1 four birds were again observed in E1. Trapping obtained the parents and one of the former visitors, but the other one escaped. It might have been no. -88. In any case only three adults were together there the next evening and no. -88 was found with an unbanded swift in shaft L1. However, four birds were together in E1 the next night, and on July 27 no. -88 was trapped again from shaft E1 with the parents and the other seasonal visitor of that shaft. With them were two non-breeding birds of the colony and two juveniles. (The life history of the parents has been published in the *Ohio Journal of Science*, **51**: 42-46. 1951.)

No. -88 returned to the campus the following year and was retrapped on May 3, 1950. Again he was in shaft E1, but with a newcomer to this shaft (42-188595) who was to take the place of the former female who died at the end of the previous summer. Soon the former male returned and nested with no. -95 while no. -88 remained as a visitor. On May 26 all three were trapped together. The nest was completed and one egg laid, but on June 5 it fell from the wall. It was then replaced immediately with another. On June 10 the same trio was again retrapped. The new nest was completed but no eggs were yet laid. Soon the trio dissolved as no. -88 left this shaft with its mates and entered shaft G3 to mate with the female (42-188592) whose former mate was found dead in the bottom of the shaft. After remaining alone for four days, she was joined by no. -88 on June 11. Together they built a nest 12.5 feet down on the west wall, and raised three juveniles from four eggs. Late in the season, after nesting was completed, no. -88 went back to shaft E1 on September 15 to roost for the night with the male which had nested there over the past seven years and a juvenile which may have been one of his 1950 offspring.

When no. -88 was first retrapped in 1951 on April 27, he was again in shaft E1 but this time he was with female no. 42-196904 (part of the life history of this bird was published in *Bird-Banding*, **21**: 99-104. 1950). This pairing did not last and on May 4 no. -88 was found in shaft G4 with a return (42-196907) which had nested there for the past two years but whose former mate did not return. These two mated and built their nest 13.5 feet down on the west wall where four eggs were laid. At the end of the nesting season the parents were trapped there with a return, the female mate from A5, two swifts which did not nest on the campus, and three unbanded juveniles. Twelve days later families were scattering and flocks were forming. No. -88 was found in shaft U1 with 42 other swifts including his mate.

In 1952 no. -88 was found as a return with his former mate no. -07 in shaft G4 on April 26. (The life history of this bird will be published in *The Auk.*) On May 10 these two had a visitor (48-166259) which may have been one of their own offspring. This bird did not remain, but occasionally a visitor was present. The mates made their nest on the same spot as the year before, in which were laid five eggs. After nesting was over they were joined by visitors. On July 20 they had roosting with them for the night the male from A5, a seasonal visitor from E1, a non-breeding adult, and seven new birds (apparently all juveniles). No. -88 spent the evening of August 6 roosting in shaft V1 with a flock of 37 other swifts, but this time he was not with his mate at the end of the season.

When no. -88 returned in 1953 he went back to shaft G4, but on May 1 he was found to have a new mate (48-164510) with him. This female had been one of his visitors in G4 in 1951. Two days later he was found back in E1 with the former mate of no. -10 (48-164517), also a former visitor, and another bird. However, he soon returned to G4 with no. -10 where they nested, placing the nest at the same spot where it had been the two previous years. They raised three offspring from four eggs.

In 1954 these two returned to G4 to mate again. This time they had a visitor (21-128602) with them during much of the nesting season. Three eggs were laid on the nest attached at the same place as the year before. On June 6 the right wing of no. -88 was painted with a white stripe, the left wing of his mate was similarly marked, while the crown of their visitor was painted white for identification. Two days later the visitor left to nest in L3 with a mate of his own. The pair in G4 continued nesting by themselves, taking turns at incubating the eggs. Upon my return on July 24 after an absence of five weeks, I found the nest had fallen from the wall and a single juvenile was clinging to the spot where it had been. (For further information on three chimney swifts nesting together and on swift nests falling down while nesting is in process see *The Wilson Bulletin*, **64**(3): 133-139. 1952, and *The Auk*, **69**(3): 289-293. 1952.)

The last capture of no. -88 was made on September 4 when he was taken from G4 with his mate, the male from shaft H1 (48-164517—which was the former mate of the present mate of no. -88), and the male from shaft L3 which was the visitor with the G4 pair earlier in the season. Fifteen days later no. -88 was recaptured as one of a total of 1303 swifts trapped by Clive Smith in Chattanooga, but at that time he was not with any of the other swifts which summer on the campus of Kent State University.—Ralph W. Dexter, Department of Biology, Kent State University, Kent, Ohio.

RECENT LITERATURE

BANDING
(See also Numbers 14, 15, 19, 35, 36, 37, 39, 41)

1. Sixth Annual Report of the Wildfowl Trust. 1952-1953. Edited by Peter Scott and Hugh Boyd. 1954. Country Life Limited. London. 162 pp. 10 shillings. A very interesting report on the work at Slimbridge. There are articles on the ringing and recovery of ducks and geese, on the behavior of geese, on success and failure of hatching and rearing. Papers of particular interest are "Trapping of the Queen's Trumpeter Swans in British Columbia" by R. H. Mackay, "Some Results of Recent British Mallard Ringing" by Hugh Boyd, and "Experiments on the Following-Reaction of Ducklings" by Eric Fabricius and Hugh Boyd in which the little birds followed boxes and a balloon moved on overhead trolleys. "South America—1953" is a fascinating account of the Scotts' trip to Chile, Tierra del Fuego, and Lake Titicaca to see new ducks. This is followed by "Behaviour of the Bolivian Torrent Duck" by Peter Scott in which two sketches illustrate displays of this rare species. Three plates in color cover the scoters, sea ducks, and mergansers; the brief life histories give a maximum of information in small space; one aspect covered for each species is whether it has ever been kept or has ever bred in captivity. Incubation periods are not well known for most of these ducks. The book is illustrated with a number of excellent photographs and with many of Peter Scott's inimitable sketches.—M. M. Nice.

2. Report on Bird-Ringing for 1953. A. Landsborough Thomson and Robert Spencer. 1954. *British Birds*, **47**(11): 361-392. In 1953 98,517 birds were ringed in Great Britain, 63,318 trapped, 35,199 as chicks. The species ringed in greatest numbers were: Blackbird, *Turdus merula*, 6,753; House Sparrow, *Passer domesticus*, 5,121; Greenfinch, *Chloris chloris*, 3,486; Lapwing, *Vanellus vanellus*, 3,270; Manx Shearwater, *Puffinus puffinus*, 3,243; Willow Warbler, *Phylloscopus trochilus*, 3,186 and Song Thrush, *Turdus ericetorum*, 3,155. A long list of selected recoveries is given. Four Swallows, *Hirundo rustica*, ringed as nestlings were recovered the following year, two at their birthplace, the others

28 and 30 miles distant. "Of others ringed as young, eight were recovered near their respective localities in their second year, two in their third year, and one in its fourth. Of birds ringed as breeding adults, four were recovered in their breeding localities in the following year; another was caught in five successive seasons including that of ringing." Starlings, *Sturnus vulgaris*, ringed in winter in Great Britain were recovered in the breeding season in Russia, Finland, Scandinavia, Germany and Holland. Two House Sparrows ringed as full-grown had moved: one ringed August 8, 1952 was found 15 miles east on April 26, 1953; the other ringed June 7, 1953 was recovered 8 miles northwest Nov. 12, 1953.—M. M. Nice.

3. Banding of the Black-browed Albatross at Heard Island and Macquarie Island. P. F. Howard. 1954. *Emu*, **54**(4): 256. Since 1949 7 young and 26 adult *Diomedea melanophris* have been banded in the small colony at Macquarie Island, which rears only 2 to 5 chicks per year. In the larger colony at Heard Island, where some 80 pairs breed in the largest group, 170 young and 80 adults have been banded. The results so far have been disappointing. Only one bird from each colony has been heard from. An adult banded at Macquarie 3 December 1952 was caught 12 April 1953 near Eden, New South Wales. A nestling banded at Heard Island 22 February 1951 was caught 9 October 1953 off Boughton Island, about 100 miles north of Sydney, Australia.—O. L. Austin, Jr.

4. Banding of Giant Petrels at Heard and Macquarie Islands. M. C. Downes, A. M. Gwynn, and P. F. Howard. 1954. *Emu*, **54**(4): 257-262. The Australian National Antarctic Expedition (ANARE) banded 2,078 young and 665 adult Giant Petrels *(Macronectes giganteus)* at Heard Island in 1951, 1952, 1953, 1954, and 199 young and 313 adults at Macquarie Island in 1950, 1951, 1952, 1954. From these bandings 18 recoveries have been received to date. The low rate of recovery is blamed on the type of bands used on 2,217 of the 3,225 Giant Petrels banded, an aluminum strip originally designed for sheep ear tags, and wrapped scroll-wise around the bird's leg. Inscribed only with the number and ANARE, AUSTRALIA, these bands were evidently too cryptic for decipherment, as well as impermanent. Only 6 of the 2,217 have been reported, and none of these beyond Australian waters. At the same time 408 B.T.O. lock-type bands inscribed INFORM ANARE MELBOURNE produced 6 recoveries, and 302 American-type bands marked SEND DOMINION MUSEUM NEW ZEALAND produced 4. These included 4 from southern South America, 2 from Africa, and one from Tahiti. All recoveries so far have been received within 41 weeks after the birds left the island, most of them within 15 weeks, and all but one of the recoveries were banded as nestlings. The one adult recovery was shot at South Georgia, after it had limped noticeably around a Norwegian whaling camp for a week with an overtight band.

When away from the breeding grounds, the Giant Petrels apparently spend their time circumnavigating the Southern Hemisphere, carried ever eastward downwind by the prevailing westerly anticyclones that blow persistently along the "roaring forties" and fifties. The authors find it "reasonable to conclude that in their first year many of the young birds travel at least once around the world, and that some may do the circuit two or three times in that period. . . . Except for one bird picked up dead soon after banding, none of the birds ringed as chicks has yet been recovered at its island of origin, suggesting that they do not breed till they are at least four years old. What happens during the intervening years is guesswork, but it seems possible that they may continue to circle the world in higher latitudes, where the chances of recovery are meagre."

As the Heard Island station is being closed, no more banding will be done there, but ANARE plans to continue the program at Macquarie Island.—O. L. Austin, Jr.

5. Recoveries of Some Birds Ringed in W. Jutland. (Nogle ringmaerkninger af vestjyske fugle.) Ernst Torp Pedersen. 1954. *Dansk Ornithologisk Forenings Tidsskrift*, **48**(3): 173-183. With English summary. Reports the results of bandings at West Jutland between 1941 and 1951. In this period 2,065

of 62 species were banded. Raw data are given for the 75 recoveries obtained from 23 species, none of them of outstanding interest or significance.—O. L. Austin, Jr.

6. Results of the Bird-Banding Carried Out by the Ornithological Institute at Zagreb in 1951 and 1952. VIII Report. (Rezultatis prstenovanja ptica Ornitološkog zavoda u Zagrebu u godini 1951. i 1952.) Renata Kroneisl-Rucner. 1954. *Larus*, **6-7** (1952-53) : 5-30. The 81 Yugoslavian cooperators banded 12,500 birds of 93 species in 1951 and 1952. Data are given for some 200 repeats, returns, and recoveries received for 24 species during the same period. More than half of these records are short term repeats of little or no significance, many of them taken at the place of banding within a few weeks, some of them only a day or so after banding. The publication of such unimportant records is hard to justify in these days of high printing costs. However, the practice followed in the list of giving the coordinates of each locality is a most excellent one.—O. L. Austin, Jr.

7. Recoveries of Birds Ringed by Foreign Institutions in the Period 1940-1952. (Nalazi ptica prstenovanih po stranim zavodima za razdoblje 1940. —1952.) Renata Kroneisl-Rucner. 1954. *Larus*, **6-7** (1952-53) : 31-52. The 147 Yugoslavian recoveries detailed here are of 39 species banded in 12 other European countries. Most interesting are 26 records of Quail *(Coturnix)* banded by the Bologna University ringing program, mostly on the east coast of Italy, that show the movements of this migratory species across the Adriatic Sea. Russian bandings are well represented by almost a score of waterfowl, mostly Mallards *(Anas platyrhynchos)*, and most of them banded in the Volga Delta. The list contains many other informative records of passerines, hawks, and herons for the most part, banded largely in northern Europe, the preponderance in Finland, Sweden, Germany, and Holland.—O. L. Austin, Jr.

8. Bird-Banding in Norway / Banding by Oslo University 1940-52. Hjalmar Broch and Per Fjeld. 1954. *Sterna* (Stavanger Museum) No. 15, pp. 1-37. We are very sorry to learn that with Professor Broch's retirement 1 January 1953 the banding conducted for the previous 13 years by the Zoological Laboratory was discontinued. This account of the work is its valedictory. It lists the 36 students and assistants who shared in the work and the totals banded by each. It lists by years the numbers banded of each of the 126 species handled, totalling 11,135 birds, from which 394 recoveries were received. The details of all the recoveries are given without comment.—O. L. Austin, Jr.

9. Bird-Banding in Norway 1953. Holger Holgersen. 1954. *Sterna* (Stavanger Museum) No. 16, pp. 1-38. This fourth list of Norwegian bandings gives the details of some 300 returns and recoveries received in 1953, and summarizes the Norwegian banding for the year. Four agencies have been banding in Norway, the Tromso Museum, Oslo University, the Government Game Investigation Service, and the Stavanger Museum. Combined totals for 1953 are 26,632, slightly down from 1953, "caused mainly by the restricted activity of the Stavanger Museum's bird observatory and ringing station at Revtangen, which in turn is caused by the increased activity here of the Norwegian Air Force. During the days of bombing and shooting exercise, the main trapping place must be abandoned. . . ."

The banding total in Norway from 1914 to 1953 is nearly 166,000. In listing returns the author has been selective, and to keep printing costs low has "omitted a great number of recoveries of lesser interest to the study of migration, most of them being young birds recovered during the first summer months at or near the ringing place, and also most retraps." The short, pertinent comments he inserts in the list after significant recoveries are a useful and informative innovation. Samples: For a Senegal recovery of the Gray Plover *(Squatarola)*, "Our southernmost one of 5 recoveries of the species." For two Stock Dove *(Columba oenas)* nestlings taken nearby, "Our first recoveries of the species, but of minor importance." And after a long list of splendid Dunlin *(Calidris alpina)* recoveries, "The many recaptures of Norwegian-ringed Dunlins at Ottenby [Sweden]

are remarkable, as they show that the same bird may choose different routes in different seasons, one year migrating along the Norwegian west coast, another year along the Baltic shores. No doubt, these birds come from very northerly parts of the breeding range."—O. L. Austin, Jr.

10. Bird-Ringing in Finland in 1952. (Die Vogelberingung in Finland im Jahre 1952.) Ilmari Välikangas and Göran Nordström. 1954. *Memoranda Societatis pro Fauna et Flora Fennica*, Helsingfors, 1954, **29**(1952-1953): 59-80. In 1952 the banders of the Zoological Museum of Helsinki University banded 8,604 birds of 117 species, most of them passerines, but a respectable number of owls, hawks, waterfowl, waders, and colonial seabirds as well. Details are given for 212 returns and recoveries received up to 31 August 1953, most of them from the 1952 bandings, a few from previous years. Short summaries of the results obtained and their significance introduce the records for each of the 39 species concerned.—O. L. Austin, Jr.

11. Results of the ringing investigation of migration instituted by the Royal Museum of Natural History, Leiden, 39 (1952), 2. (Resultaten van het ringonderzoek betreffende de vogeltrek, ingesteld door het Rijksmuseum van Natuurlijke Historie te Leiden, XXXIX (1952), 2.) G. C. A. Junge and J. Taapken. 1954. *Limosa*, **27**(1-2): 39-60. This second half of the reports of the Netherlands 1952 bandings (for the first see *Bird-Banding*, **25**: 152) lists the raw data for some 480 returns and recoveries of 44 species from the terns through the passerines. Well over half (259) of the records are for the Starling *(Sturnus vulgaris)*, which also comprised 8,675 of the 19,163 birds of 160 species banded under the Dutch program in 1952. With the large amount of information now at hand on the Starling from several European marking programs, it seems someone should start gathering it together and analyzing it. Nothing seems to have been published as yet on this wealth of raw data. Of interest in this list are two Long-eared Owl *(Asio otus)* recoveries, both banded as nestlings, one taken after 11 years 4 months, the other after 14 years 4 months.—O. L. Austin, Jr.

12. The Göteborg Natural History Museum's Banding of Migratory Birds in 1952. (Göteborgs Naturhistoriska Museums Ringmärkningar av Flyttfåglar under 1952.) Viking Fontaine. 1953. *Särtryck ur Götsborgs Musei Arstryck*, 1953. 30 pp., 1 map. The regrettable downward trend in Swedish banding (see *Bird-Banding*, **24**: 69) continued through 1952. The efforts of 11 banders totalled only 3,216 birds of 134 species. The largest number banded by a single cooperator was 305. Starlings *(Sturnus vulgaris)* lead the list of species with 323, followed by 216 Redwings *(Turdus musicus)* and 147 Lapwings *(Vanellus vanellus)*. The 240 returns and recoveries of 64 species received during the year bring the total to 6,725 to date, 2.8 percent of the 237,111 birds banded under the Göteborg program since 1911. Six birds banded abroad were recovered in Sweden, 3 Teal *(Anas crecca)* from England, a Goldfinch *(Carduelis carduelis)* and a Marsh Warbler *(Acrocephalus palustris)* from Helgoland, and a Black-headed Gull *(Larus ridibuudus)* from Holland. Among the older birds reported are a 12-year Peregrine Falcon *(Falco peregrinus)*, a 20-year Heron *(Ardea cinerea)*, and a 7-year Lapwing *(Vanellus)*.—O. L. Austin, Jr.

13. The Göteborg Natural History Museum's Banding of Migratory Birds in 1953. (Göteborgs Naturhistoriska Museums Ringmärkningar av Flyttfåglar under 1953.) Viking Fontaine. 1954. *Särtryck ur Göteborgs Musei Arstryck*, 1954: 7-26. The 3,557 birds of 128 species banded in 1953 bring the Museum's totals to 240,668 birds of 228 species. The list of recent returns and recoveries contains some interesting records. A Scaup Duck *(Aythya marila)* banded at Golland in 1947 was reported in 1953 from Ust-Tsilma on the Pechora River, northwest Siberia, and a Shoveler *(Anas clypeata)* banded at Golland in 1950 was taken the next year near Archangel. An Osprey *(Pandion haliaetus)* banded 4 July 1952 at Närke was taken 3 September 1952 some 1,500 miles eastward near Borskoje, Siberia. Foreign bandings recovered in Sweden and reported

to the Museum include 3 from England, 2 from Helgoland, 1 from Norway, and 1, a Teal *(Anas crecca)* from the Volga Delta. Longevity records include a 12-year-old Swift *(Apus apus)*, a 12-year Lapwing *(Vanellus)*, and a 7-year Oystercatcher *(Haematopus)*.—O. L. Austin, Jr.

MIGRATION

(See also Number 4)

14. On the Migration of Norwegian Thrushes and Blackbirds. (Trostetrekk.) Holger Holgersen. 1953. *Stavanger Museum Yearbook*, 1953: 91-102. The English summary states: "Basing upon recoveries of ringed birds a preliminary account is given of the migration of Norwegian thrushes and blackbirds—preliminary because the material is still rather scanty.

"In the autumn, the Song-Thrush *(Turdus ericetorum)* migrates in a south-westerly direction to its winter quarters in France, Portugal, and Spain. This south-westerly route is used also by the Ring-Ouzel *(T. torquatus)*, whilst the Redwing *(T. musicus)* migrates more 'fanned out,' more dispersedly south and south-west, wintering in France, the Iberian Peninsula, and Italy.

"The Blackbird *(T. merula)* has its principal winter quarters in Britain, reaching them chiefly by crossing the North Sea, partly over land (Jutland, NW-Germany, Holland). Wintering may take place as far north as in Shetland, and parts of the population winter even in Norway. The return flight in spring takes place in much the same manner, some birds crossing the ocean, others flying over land." The five maps illustrating these movements are somewhat misleading, because the straight lines connecting points of banding and recovery suggest straight flights which the birds seldom if ever make.—O. L. Austin, Jr.

15. Abnormal Winter Flight of the Common Gull. (Unormalt vintertrekk av fiskemåke *(Larus canus* L.). Holger Holgersen. 1954. *Fauna, Norsk Zoologisk Forenings Tidsskrift*, Blindern University, Norway, 1954 (2): 63-68. The English summary: "During and after a cold spell of weather in NW Europe in late January 1954, six Norwegian-ringed Common Gulls were recovered far south of the normal winter range for our populations of this species. These and other recoveries, together with detailed information in letters reporting the recoveries, indicate that both the gulls and other Norwegian migrants, wintering in Britain, N. France etc., were then forced to renew their southward movement and were driven ahead of the weather, to S. France and the Iberian Peninsula. The map shows the normal winter range of Norwegian Common Gulls, and our recoveries during the winter 1953/54 (Stavanger Museum rings)."—O. L. Austin, Jr.

16. Firecrests in Britain, 1952-1953. P. S. Redman and W. D. Hooke. 1954. *British Birds*, **47**(10): 324-335. A discussion of the unusually large fall migration of *Regulus ignicapillus* into the British Isles, followed by wintering, as well as a further large immigration in spring. Three weather maps are presented for October 13, 14 and 18-19 and one for April 4-5 as well as a table of direction and speed of winds for the latter date. "It is inferred that two entirely different movements originated in the north and west of Germany within a few days of each other during October, 1952. . . . Support is given to Williamson's (1954) theory that the reason for Chiffchaffs wintering in Britain is due to adverse weather conditions inhibiting the migratory urge, by the fact that both Firecrests and Chiffchaffs wintered in larger numbers than usual in 1952/53."—M. M. Nice.

17. Migration by swimming in two *Podiceps* species. (Simflyttning hos skäggdopping *(Podiceps cristatus)* och gråhakedopping *(P. griseigena)*.) Tore Andersson. 1954. *Vår Fågelvärld*, **13**(3): 133-142. (From the English summary.) During the August migration from August to October, Great Crested Grebes *(P. cristatus)* and Red-necked Grebes *(P. griseigena)* pass the Swedish coast facing

the Aland Islands on their way southward. The Scandinavian Grebe populations are believed to migrate almost exclusively by night. While some fly by during the day, many "approach swimming over the sea from directions between N and E and then follow the coast south at a distance of usually 50-200 meters [offshore] swimming (and also diving for fish) at a pace of some 2km/hour on the average." The author suggests that "the diurnal migration by swimming in this case would be not a casual phenomenon, but a semi-regular behavior in the diurnal 'lower phase' of the migratory rhythm."—O. L. Austin, Jr.

18. On the night-migration of thrushes and their probable orientation. (Waarnemingen over de nachttrek van lijsters *(Turdus)* en hun waarschijnlijke oriëntering.) D. A. Vleugel. 1954. *Limosa*, **27**(1-2): 1-19. (From the English summary.) From nightly counts of the calls of migrating thrushes in October and November, 1950, the author draws a number of interesting conclusions. The highest frequency of sounds usually occurred before midnight, with occasionally under certain conditions a second peak around 4 A.M., after which the birds continued flying in daylight. The thrushes made few sounds during variable or changing winds, and with a change in wind direction at night, even in good weather, migration came to a standstill. Migration was heavier with a headwind than with a tailwind, with no moon than in moonlight, during an overcast than with a clear sky, with light winds than with moderate winds. With strong winds migration usually stopped, and there seemed to be little or no movement in rain. No indication was found that thrushes fly at great heights at night as Chaffinches *(Fringilla coelebs)* and other migrants do by day. The author believes "the migrating thrushes use the position of the sun at sunset to find their standard direction, and maintain this course with the help of the direction of the wind."—O. L. Austin, Jr.

19. Ornithological Observations from Lista 1953. Michael K. Swales. 1954. *Sterna* (Stavanger Museum) No. 14, pp. 1-34. The third annual report of a group of six ornithologists who spend the autumn months watching the migration at Lista, a headland on the southwest coast of Norway. As a comprehensive paper is planned after 5 years of observations have been completed, this report is descriptive rather than analytical. Five main peaks of migration were noted between 7 September and 24 October, "each apparently associated with the approach or presence of anticyclonic conditions." A total of 173 species was recorded. The daily totals of the commoner species are listed in tabular form and shown graphically against the pressure record.

Most of the observations were on diurnal migration, but night watches were kept as well, particularly at the Fyr lighthouse during periods of poor weather. In view of the recent interest in ceilometer casualties in the United States, the following notes on the weather conditions under which birds are attracted to the Fyr lighthouse are significant: "It appears that the best nights for this are those on which there is 10/10 cloud, slight drizzle, light breeze and visibility of ca. 5-7. At visibilities less than this the number of birds coming to the lantern is first greater, but the fog signal frightens them away. If these conditions are merely a continuation of those which have existed throughout the previous day, there is little or no nocturnal migration. A night that starts clear, but which changes to the above condition later, results in the greatest number of birds coming to the lantern; however, as soon as the first stars appear again, the number of birds diminishes rapidly."

The party banded 412 birds of 31 species, most of them taken in a Helgoland trap in the light-keeper's garden. Others were taken at the light at night. Five recoveries of these birds are given, the most recent in May 1954.—O. L. Austin, Jr.

POPULATION DYNAMICS

20. Concerning the White Stork in Osnabrück. (Vom Weissen Storch im Bezirk Osnabrück.) 1954. Matthias Brinkmann. *Die Vogelwelt*, **75**(5): 194-200. The White Storks *(Ciconia ciconia)* at Osnabrück have fluctuated in num-

bers between 20 and 39 pairs since 1927. Low years were 1927, 1949 and 1953. Reproduction was particularly successful in 1946 and in 1951. Over a 10-year period the storks threw 44 eggs and 23 young birds out of their nests, almost always during fights. Some of the fighting was caused by storks trying to take over nests with apparently unattached widows and their eggs. It appears to me that the fighting cannot be attributed to scarcity of nests, as Brinkmann states that nest sites were not a limiting factor. His tally of available nests showed only 22 out of 46 occupied in 1953, the year in which the most eggs (11) were thrown out. Early spring return of adults increases reproductive success. The average number of young fledged per pair over a 10-year period was 2.09. Brinkmann used an interesting technique to discover local attitudes toward storks; he asked school children to write essays on storks with the help of their parents.—Frances Hamerstrom.

LONGEVITY AND MORTALITY

(See also Numbers 12, 13, 35, 36)

21. Unaccountable Death of Birds. Motoichi Chiba. 1954. *Tori*, **13**(64): 48-50. In Japanese with short English summary. A decrease of the wild bird population was noted in Niigata Prefecture. Cause of death of most of the many birds found dead was undetermined, but some specimens examined, particularly of migrants, showed radioactivity.—O. L. Austin, Jr.

22. Migration emergency by Radioactivity. Tamiya Narusawa. 1954. *Tori*, **13**(64): 51-54. In Japanese, with English summary as follows: "The decrease of birds in Kamo, Niigata, is suggested numerically, particularly in the swallows. From the result of the count examination of radioactivity made by Dr. Watanabe, Niigata University, its influence on birds may not be denied, though not fatal."—O. L. Austin, Jr.

LIFE HISTORY

23. Life Histories of Central American Birds. Families Fringillidae, Thraupidae, Icteridae, Parulidae and Coerebidae. Alexander F. Skutch. 1954. *Pacific Coast Avifauna*, No. 11. Cooper Ornithological Society, Berkeley, Cal., 448 pp. Paper covers, $9.00; buckram, $10.00. A very remarkable book. This distinguished ornithologist and botanist has spent 16 nesting seasons studying Central American birds, 9 of them at El General on the Pacific slope of Costa Rica at an elevation of 2,500 feet. Two seasons were spent "in the lowlands of Panamá, one each in the Caribbean lowlands of Honduras and Guatemala, one on the Caribbean slope of Costa Rica, at 2,000 feet, one in the highlands of Costa Rica and one in the high mountains of Guatemala" (p. 14). He has gathered together in this book life history studies of 9 fringillids, 13 tanagers, 14 icterids, 5 wood warblers and 3 honey creepers, a total of 44 species.

Each study is clearly organized under many headings, as, for instance, with the Song Tanager, *Ramphocelus passerinii*; characteristics and habitat, food, roosting, voice, nest building, the eggs, incubation (including a table on incubation patterns of 16 individuals of 12 species of tanagers), defense of the nest, a nest with two claimants, the incubation period, the nestlings (including three tables on rates of feeding), brooding, departure of the nestlings, the young after leaving the nest, the breeding season and second broods, the question of polygamy, nesting success, summary. Each of the five families is also summarized, and comparisons are made with nesting studies of representatives in the Temperate Zone.

In migratory species of tanagers, orioles, and wood warblers the male is usually brilliant and the female dull colored, but in many of these species in the Tropics both sexes are equally gorgeous. Moreover, in Central America, the young normally acquire adult plumage shortly after leaving the nest. In the honey creepers, however, where the males are highly colored, the females are much more soberly

clad. In most species of the five families the females incubate alone and also brood the young, but in the majority of cases the males help feed the young. In the tanagers and warblers (all of the warblers build domed nests) incubation and nestling periods are longer than in the Temperate Zone. With the tanagers, "The nestling period is variable; it is shortest in those species which habitually nest low (11 to 13 days in *Ramphocelus)*; it is somewhat longer in species whose open nests are placed higher (14 to 16 days in *Tanagra*, 16 to 20 days in *Thraupis)*; it is longest in species which build roofed nests (17 to 24 days in *Tanagra* and up to 23 or 24 days in *Chlorophonia),*" (p. 260).

Helpers at the nest were recorded with only two species—both tanagers. With many of the species there is a close bond between mates throughout the year. Much attention is paid to song; in a few cases females have musical songs. Anting was seen with a Buff-breasted Saltator, *Saltator maximus*, (p. 62). Complications sometimes arose between females that nested close together, as with he Saltator and Song Tanager. The 14 species of icterids present a varied picture, from the orioles with their bright plumage, melodious songs, and well-woven nest pouches, to the parasitic Giant Cowbird, *Psomocolax oryzivorus*, that lays its eggs in the nests of colonial, pouch-weaving members of its own family—the caciques and oropéndolas. As to nestling periods, the North American Cowbird, *Molothrus ater*, and Redwinged Blackbird, *Agelaius phoniceus*, leave the nest at 9 to 11 days; Boat-tailed Grackles, *Cassidix mexicanus*, at 21 to 23 days; *Oropéndolas, Gymnostinops* and *Zarhynchus*, at 30 to 37 days. Like many others, Dr. Skutch missed Amelia Laskey's fine study of 29 color-banded *Molothrus ater* (1950, *Wilson Bulletin*, 62: 157-174) in which all her "observations indicated that the species was monogamous."

The volume is illustrated with numerous photographs by the author of nests and habitats, by black and white sketches of many species by Don Eckleberry, and has a handsome color plate of five species of tanagers by the same artist. There are a bibliography of about 100 titles and indices of common and scientific names of the birds.

This book is a mine of authentic information, based as it is on the author's zeal in searching for the truth, his deep sympathy with his subjects, and his meticulous care in all his scientific work. It presents an extraordinary picture of the natural history of the 44 birds about which little or nothing was known. It constitutes one of the most notable contributions ever made to life history study. In short, it is of utmost importance as a guide and inspiration to all bird students interested in the study of the living bird and particularly to those of us primarily engaged in watching passerines.—M. M. Nice.

24. The Territorial Range of the Alabama Towhee. May S. Lauden. 1954. *Alabama Bird-Life*, **2**(1-2): 3-15. Ten representative territories of *Pipilo erythrophthalmus canaster* were studied and mapped (Figure 1) in Auburn, Alabama. The birds remain in pairs the year round on their territories which ranged from 1.7 to 6.4 acres, averaging 3 acres in size. Fighting between males was seen in November. Males drove away Blue Jays and English Sparrows, but not other species. "Whenever 2 male towhees foraged on the same ground, the male who had established the territory would approach the intruder without any particular display of belligerence, and when arriving at a point about 3 feet from him, the intruder would then fly away," (p. 7).

Nests were built from ground level to a height of 6 feet. Sets ranged from 2 to 4 eggs, averaging 3. Incubation lasted 12 to 13 days and was performed by the female. In two of the territories, "As soon as the first eggs hatched, the female left in an unusual hurry, flew to the male's feeding ground from which they both returned immediately, he going to the nest and she perched on a nearby limb until he departed," (p. 13). Males did most of the feeding of the young. They were noted singing on the ground and as high as 60 feet above it. Scratching in leaves "suddenly ceased about the middle of April. . . . The scratching apparently is not necessary during warm weather when insects are plentiful."—M. M. Nice.

BEHAVIOR

(See also Numbers 23, 24)

25. Colonial Behaviour in the House Sparrow. D. Summers-Smith. 1954. *British Birds*, **47**(8): 249-265. Observations on *Passer domesticus* in a rural area of 2 square miles in north Hampshire. The birds were found to nest in discrete, isolated breeding colonies of about 10-15 pairs. The sparrows in one colony were color-banded for a number of years. In fall the legs of young birds are smooth, those of older birds hard and scaly. In fall first year males start prospecting for nest sites, but by November are repulsed by the owners. "In February the first of the first-year males begin to adopt permanent nest sites and acquire mates. In the majority of cases once a male has taken up a permanent site he retains possession of it throughout his life. However, if he is unable to obtain a mate he may take up a new nesting-site and try to obtain a mate there." Center nests are preferred to those on the periphery. "Behaviour appropriate to the stage of the colony is very infectious; nest-building by one pair may induce other pairs to follow suit, and in the same way coition by one pair elicits the same behaviour in surrounding pairs. . . . On the other hand the stage of the breeding cycle varies from colony to colony." "Whereas possession of the nest is retained by the cock even during the moult and he usually visits it in the morning and evening on his way to and from the grain-field, the hen normally loses interest in it for a month or so at this time." Young birds may settle in adjacent colonies. Attachment to nest sites appears to be less strong in studies in Holland (Daanje, 1942) and in North America (Weaver, 1943). A splendid example of careful, well-planned work based on color-banding of a very common species.—M. M. Nice.

26. "Anting" by Wryneck. R. C. Stone. 1954. *British Birds*, **47**(9): 312. A *Jynx torquilla* shuffled along a lawn where there were many ants; it shook its half-opened wings and tail and seemed to be rubbing something into its plumage with its beak.—M. M. Nice.

27. "Anting" by Blackbird. W. M. Logan Home. 1954. *British Birds*, **47**(9): 312. A female *Turdus merula* picked up ants, tucked them "under both wings, next the body, and also at the root of the tail (on the top). It also sometimes ate the ants as well."—M. M. Nice.

28. "Anting" by Blackbird. W. P. C. Tenison. 1954. *British Birds*, **47**(9): 312-313. A hen Blackbird repeatedly picked up ants from the ground and rubbed them under her wings and tail. She "appeared in a state of ecstasy." The editors discuss the subject briefly, mentioning several inconclusive theories. "Now, however, the solution seems to have been provided. As already reported by Julian Huxley in his summary of the recent XIth International Ornithological Congress (*Country Life*, June 24th, 1954, p. 2084), H. Poulsen of Denmark has described observations on the subject which show convincingly that these actions are instinctively carried out to rid the sensitive skin on the bird's head of the irritating formic acid squirted up by the ants as a defense." I fail to see how this theory explains in any way the behavior of the many species I have watched anting with sumach berries, orange skin, hot chocolate, soap suds, and ants.—M. M. Nice.

29. Some Concepts of Ethology. W. H. Thorpe. 1954. *Nature*, **174**(July 17): 101. A clarification of this approach to the study of behavior, incidentally answering some recent criticisms. Dr. Thorpe summarizes the "essential elements of Lorenz's formulation" thus:

"(1) The division of behaviour into a flexible appetitive behaviour and the relatively rigid consummatory act.

(2) The assumption that the fixed action pattern of the latter is generating some specific action potential. . . . This brings back in a new form the concept of internal drive, so resuscitating the essential idea of instinct.

(3) The concept of the 'innate releasing mechanism' which assumes there to be within the central nervous system a series of mechanisms of a particular type

which effectively inhibit or block all discharge of activity unless the animal encounters the right environmental situation or stimulus to remove or release the block."—M. M. Nice.

30. An Attempt at Analysis of Hummingbird Courtship. (Versuch einer Analyse der Kolibribalz.) Helmuth O. Wagner. 1954. *Zeitschrift für Tierpsychologie*, **11**(2): 182-212. A very interesting paper based on Dr. Wagner's 11 years of experience in Mexico where he became acquainted with 14 species of Hummingbirds; he has also made a thorough study of the literature. From the English summary we learn: "The female hummingbird searches for a mate only having finished building her nest. She mates with the first conspecific male which she meets and this union lasts only for a few hours." Courtship consists first in attracting the female, and second, in stimulating her by display flight, often accompanied by song or mechanical production of sound. In the luring phase there are three degrees of vocal sound production: song of a single bird, singing in groups, song combined with display flights. There may also be mechanical sound from modified flight or tail feathers during display flights. In courtship proper there are wild and elaborate flights of the partners; these are illustrated by some 20 sketches.

"The songs of different species show a gradation of differentiation. A low melodious song exists in all species as long as the birds are in juvenile plumage. In the adult males in nuptial plumage this subsong is developed into a loud song or into a strophe of one to four syllables which is repeated continuously." In courtship there exists "a series of differentiations: At the lower end of this series there are species in which there is comparatively little sexual dimorphism in behavior and/or coloration, while at the other end there are forms in which the development of the nuptial flight as well as that of the male plumage attains its maximum. . . . There is a strict correlation between the differentiation of the nuptial flight and that of the male's plumage: the more complicated the former, the greater is the sexual dimorphism." The fact that some species have modest and others splendid feathering, that some show simple and others elaborate courtship patterns would seem to be an example of the drive towards extravagance often shown in nature. "Play flights" are often indulged in by young birds either singly or in company. Similar play flights occur in some of the swifts and also in a few of the tyrant flycatchers, in which display flight is a part of courtship. —M. M. Nice.

31. The Reproductive Behaviour of the Zebra Finch *(Poephila guttata)*, with Special Reference to Pseudofemale Behaviour and Displacement Activities. Desmond Morris. 1954. *Behaviour*, **6**(4): 271-322. An exhaustive study of the behaviour of this small Australian ploceid, based on 23 individuals in captivity. The male builds a domed nest with a side entrance, while the female takes the larger share in incubation and in care of the young. Feeding in the dark nest is facilitated by the brightly marked gapes of the nestlings—7 black spots form a semicircle on the white roof of the mouth. The parents feed by regurgitation. Young spend 2 weeks in the nest and are independent in another fortnight. The author groups under "agonistic behaviour" "the groups of activities associated with intraspecific fighting. These activities include attack, threat, submissive and fleeing behaviour." (In the Century Dictionary "agonistic" is defined as "pertaining to contests"; it comes from the same Greek word as does "agony," the first meaning of which is "a violent contest or struggle.") "In general the more dangerous the weapons possessed by a particular species, the more that species relies upon its agonistic code in the settlement," (p. 273). The Zebra Finch, possessing only mildly dangerous weapons, depends chiefly on chasing and pecking.

Agonistic postures are described, but most attention is paid to courtship with the upright pivoting, song-accompanied dance of the male and the rapid quivering of the tail of the female. When females were unresponsive, their mates sometimes showed this female display; the suggestion is made that this results from "strong sexual thwarting in combination with the arousal of the drive to flee." Many displacement activities are described and a possible reason for the complexity of the markings of the Zebra Finch is discussed.—M. M. Nice.

32. The Courtship Behaviour of the Cutthroat Finch *(Amadina fasciata).* Desmond Morris. 1954. *Avicultural Magazine,* **60**: 169-177. As a favorable subject for the study of the comparative behaviour of related species, some English ethologists have chosen the Mannikins and Grassfinches that breed readily in captivity. The Cutthroat, although at present classified with the Amadinae, is not a typical Mannikin. This is a semi-social species, many pairs nesting in close proximity. The song of the male has no threatening effect, but is used "as an almost non-stop accompaniment of the courtship dance." This dance, which displays all the special markings of the male, may be described as an "inverted curtsey." "His upright posture and his hesitant advance . . . lead one to think of his mood as being basically a conflict between a sexual tendency to mount the female and at the same time a tendency to flee from her," (p. 174). In her invitation display the female quivers her tail "in a series of immensely rapid vibrations." Apparently all the Grassfinches and Mannikins "possess back and wing plumage colour which merges with their natural environment." But on the ventral surfaces there are "bars, spots, bands, and patches of colour and intense contrast. These are displayed to the female by the courting males, and it is remarkable to note how frequently the particular patch of colour or contrast, possessed by a particular species, is displayed so well by the special dance movements and posturings of that species."—M. M. Nice.

33. Polygamy in Wheatears. (Polygami hos stenskvätta *(Oenanthe oenanthe).*) Wolf Jenning. 1954. *Vår Fågelvärld,* **13**(3): 167-171. (From the English summary.) Describes two cases observed near Stockholm. The first occurred in a marked pair nesting in the same territory they had occupied the 2 previous years. While the hen was incubating, the cock paired with another hen who built a nest about 160 meters away. The broods hatched 23 days apart. The bigamous cock helped feed the young in the first nest until a few days before the second brood hatched. He then confined his attentions to the latter, though the first brood was not yet independent. In the second case the nests were about 350 meters apart and, from the size of the young, the first brood preceded the second by only 7 or 8 days. This cock helped feed the young in the first nest, and when the second brood hatched he fed both sets for some days. He then took no further notice of the first hen and her young and fed only the second brood.—O. L. Austin, Jr.

34. Irrepressible Nuthatch. Louise de Kiriline Lawrence. 1954. *Audubon Magazine,* **56**(6): 264-267. An important contribution to the ethology of *Sitta canadensis,* based on observation of color-banded birds, and most delightfully told. Young Redbreasted Nuthatches have green legs, while in older birds the color becomes olive green or almost black. Pair formation occurs in winter and, in the instance watched, the female, a young bird, took the initiative. The day-to-day life of the mates, the spring singing of the male which is not really territorial nor a call for a mate, but seems to spring "mostly from pure enjoyment," "courtship feeding," all these are described in detail. The gum smeared around the entrance to the nest hole sparkled in the sun like eyes; it is suggested that "eyes in nature, whether live or imagined, as they may appear in a pattern or as light strikes an object or a substance, seem to have a discouraging effect upon would-be trouble makers." The pair raised a second brood the first season, apparently the first record of such an occurrence for the species.

In one of the sketches by Walter Ferguson illustrating the article four fledglings are shown close together on a branch with a parent standing on the back of one while feeding it. As no mention of this surprising episode is made in the article, I wrote to the author inquiring about it. She never has seen all the fledglings collected together on one branch; instead "they are scattered around in the foliage, one here, one there, so there is no occasion for the parent to step on it when feeding it."—M. M. Nice.

WILDLIFE MANAGEMENT

(See also Number 1)

35. Mourning Dove Populations in North Carolina. Thomas L. Quay. 1954. Wildlife Resources Commission, Raleigh, North Carolina, pp. 1-47, 2 tables, 24 text figs., June 1954. This general summary of the information obtained by the North Carolina Mourning Dove Project from August 1949 through February 1953 was edited by Dr. Quay at the request of the Wildlife Resources Commission after Donald G. Allison, who conducted and supervised the project, resigned in late 1953 while in the process of summarizing his data. It is well written in a simple, popular style "as a report to the sportsmen and people of the State, for their information and use in acquiring a clearer understanding of the principles involved in sound mourning dove conservation and management" (Director Patten's foreword).

The audience at which this attractive booklet is aimed, the dove hunters of North Carolina, will doubtless receive it most cordially. All information that might disturb them is carefully played down, and they are exhorted to continue the most damaging of their practices, killing doves in early autumn before the local population has finished nesting. "A good dove hunt affords lots of shooting, at fast-moving targets. What better warm-up is there for the regular fall hunting season soon to follow?" (p. 35). Splendidly exciting photographs of dove hunting are interspersed with enough graphs and tables to lend the false conclusions the ring of truth based on sound scientific investigation.

A semipopular dissertation of this sort naturally cannot present the available data in full, nor comment on them adequately or in detail. A mimeographed compilation (40 tables, 3 graphs, 1 map) of some of the original data has been issued separately and given limited circulation. The information to be gleaned from this publication does not always support and sometimes contradicts the main paper's conclusions. For instance, on p. 18 of the subject paper, site tenacity is claimed to be exhibited "in about the same degree . . . [by] spring and fall transients, summer residents, and winter visitors." The mimeographed return data show the banding returns of the summer population to be considerably higher than those of the wintering and transient populations.

The paper makes extensive use of the banding data gathered by the project, but the analysis of them leaves much to be desired. The failure to describe methods of trapping or to estimate trapping efficiency makes comparison with other sets of data rather misleading. Inspection of the mimeographed tables suggests that the North Carolina trapping effort was less stable and its efficiency somewhat lower than ours on Cape Cod.

I should probably feel complimented by the project's adoption (unacknowledged) of some of my methods in presenting its data (see *Bird-Banding*, **22:** 149-174). The use of the same 10-day periods in grouping repeat records certainly facilitates comparison. But in adapting the caption of my fluidity graph to their copy (pp. 16-17), the compilers forgot that their data cover only a 4-year period, not a 5-year one as in my original.

At least three and perhaps four or more separate dove populations are represented in the North Carolina sample. Failure to separate them adequately in analyzing the banding data prevents the delineation of any clear picture of their separate movements. The one important and unescapable fact to the hunters and game managers of the State that the banding data are made to show is the low ebb of doves in October and November, the heart of the hunting season. The North Carolina dove hunters are dependent for most of their sport on birds produced outside their State. These go through the territory so early in September and October that in order to harvest them they must put undue pressure on their own breeding population which has not yet finished nesting. The paper neatly avoids this crucial issue with the statement (p. 42) "The exact importance of this late breeding to the whole population is not yet clear."

The project failed to obtain (or at least fails to present) any reliable estimate of dove production within the State, and makes no effort to estimate the effects of hunting on the local breeding population. These are serious omissions, but

after all, whether or not their own covers produce doves for them is only of academic interest to the North Carolina hunters. Why worry about such inconsequentials when year-round protection on the doves' northern breeding grounds assures them a continuing supply of migrants?

The paper's estimate of "Mortality Due to Hunting" (pp. 39-40) is most interesting. Starting with the percentage of banded birds reported shot, 1.5 percent, guessing at the proportion of those killed that the hunters probably report, and adding an equally unsubstantiated surmise of the illegal kill and the crippling losses, the hunters are assured they are killing not more than 15 to 20 percent of the population each year. This is claimed to be a very liberal estimate, which "may well be less." And as the total annual mortality is about 70 percent, this must be quite comforting. However, table 38 of the mimeographed supplement presents figures made by the project biologists on birds present, killed, and crippled on 65 separate shooting fields studied over four September seasons. The hunters here are shown to account for an average of 32 percent of the birds present. This is hardly light gun pressure, and represents a dangerously high proportion of the species' probable replacement potential, of which no mention is made.

The average Carolina hunter who reads this pamphlet is also going to be strongly impressed by the fact that the number of days of the open dove season has been reduced by Federal regulation in the past 36 years from 107 whole days to 30 half days, and the daily bag limit from 35 to 8 doves. (Oh, the injustice of it!) A graph showing the disproportionate increase of hunters and the corresponding decrease of doves during this same period would have been most apropos. —O. L. Austin, Jr.

36. Status, Movement and Management of the Mourning Dove in Florida. Frank A. Winston. 1954. Technical Bulletin No. 2, Florida Game and Fresh Water Fish Commission, pp. 1-86, 20 tables, 19 maps. This paper is propaganda to lengthen the dove hunting season in Florida disguised as a scientific report. Its conclusions and recommendations, reached by a rash and careless disregard for facts and logic, could well lead to the species' extinction if they were ever taken seriously. Among the most unreasoned and dangerous are the contentions (p. 82) that "with our present regulations, hunting activity does not just 'not harm' the dove, it makes no difference to the dove; that furthermore the earlier the hunting season can be set, the greater the take which can be allowed without reducing the spring breeding population."

I feared when I first pointed out (*Bird-Banding*, **22**: 171) the discrepancy between the roughly 70 percent annual mortality in the Mourning Dove and the 4 percent or less of the banded doves reported shot, that someone would use this to argue that hunting is of no significance to dove survival. Although I showed some of the fallacies in such reasoning, the author boldly asserts that hunters do not account for more than the minimum 4 percent per year proved by the banding recoveries, and therefore should be allowed to take a larger share of the remaining 66 percent, which he claims is all wastage from "natural causes."

When he states (p. 81) that banding recoveries are a "reasonably accurate reflection of mortality due to hunting activity," I agree with him. I believe that banding recoveries, *honestly evaluated*, are the best evidence of hunting mortality available, and far more reliable and informative than the coo counts, random road counts, bag checks, and other boondoggles Pittman-Robertson funds have been squandered on. His interpretation of the recoveries, however, undervalues the variables that experience has shown them to contain. He states (p. 81) that "Loss of bands through illegal kill or through non-return is believed to be negligible," and that crippling losses "will not exceed twenty-five percent of the total birds brought to bag."

He bases his premise that hunters fail to report only a negligible number of bands on the alleged failure of a publicity campaign in Florida to increase the percentage of recoveries (p. 72). Yet we find (p. 48) that the recovery rate augmented by this publicity in Florida alone was 3 percent, whereas that for the entire southeastern dove project, including Florida, was only 2.3 percent. Various Florida samples for the publicity period quoted elsewhere in the paper range

from 5 to 9 percent recovery, increases of 100 to 400 percent. Considering the tremendous effort needed to overcome public apathy and inertia, even the 23 percent increase in the comprehensive recovery figures is not to be dismissed cavalierly. Current evidence on the percentage of recovered bands reported is slight and inconclusive, but most unbiased observers believe that not more than half the bands that come to human notice are reported, and many banders, myself among them, consider the probable reporting rate far lower.

Being a fairly experienced hunter myself, I am highly suspicious of the author's low estimate of crippling losses, and his naive claim that the illegal kill is negligible makes me wonder just how much field experience he has had, especially here in the South where game-law enforcement is notoriously lax. Most students of the evidence admit that hunting mortality in the Mourning Dove today is at least 15 percent, and some evidence is available (see No. 35 above) indicating it may be twice that amount.

Typical of the sort of reasoning found throughout the paper is this essential cog in the author's thesis (p. 71): "It is believed that if there were no hunting of doves at all throughout the country . . . this [70 percent] rate of mortality would remain approximately the same." Unsubstantiated and indefensible as this premise is, the author reasons from it that as 70 percent of the dove population is going to die every year anyhow, the hunters should be allowed to kill more than their present bag. This is a paralogism no college freshman would dare attempt if he expected to pass Logic 1.

The author disregards completely the fine balance which has been shown to exist between the mortality and replacement rates, and the importance of keeping the death rate below the rate of recruitment. In fact he is not at all concerned with dove production, and makes no attempt to assess the local breeding population. His main concern with dove breeding is to note that the entire population is at its peak toward the end of the nesting season, and to urge that the hunting season be set as early as possible to take advantage of the larger number of birds then available (p. 83): ". . . the prospect of delaying a season to permit a few late nestlings to fly, while at the same time permitting hundreds of thousands of older birds to die from natural causes, unharvested, seems to be carrying the sacredness of motherhood to something of an extreme."

The paper is full of unsubstantiated premises and nonsequiturs and, aside from its unabashed sophistry, it is badly done in other respects. The text contains awkward redundancies and occasional lapses in grammar. Even casual comparison of the maps, tables, and text reveals errors, inconsistencies, and contradictions which show how carelessly the work was done.

As for that unqualified claim that hunting under present regulations "makes no difference to the dove," I find this interesting observation on p. 59: "It was the experience of this writer and others, that when [dove] shoots were held on successive days, or even a few days apart, the hunting declined because the birds wouldn't come back, or if they did, they were flying high out of gun range." As they believe hunting has no effect on the dove, there was of course no reason for the investigators to try to determine how many doves were left to come back, or where the survivors, if any, went.

If this paper is a fair sample of the use to which Pittman-Robertson funds have been put, I shudder for the future of government subsidized research in the natural sciences. It will not take many such biased and badly executed reports to damage irreparably the scientific reputations of those ornithologists who make their livings by working for the taxpayer.

I hope that the original raw banding data gathered at such great expense (and poor planning) by the Florida Mourning Dove Project are still available for study and analysis, and that someone capable of doing so accurately and honestly will be given the opportunity not only to do so, but to publish the results. —O. L. Austin, Jr.

37. Waterfowl Conservation in Victoria. M. C. Downes. 1954. *Emu*, **54**(3): 169-180. Overshooting and loss of suitable habitat with the rapid development of agricultural and other land-use programs are threatening seriously the survival of a number of Australian game species. The Fisheries and Game De-

partment of Victoria has launched an extensive and well-thought-out program of rehabilitation in which banding is taking a prominent part. This article stresses the importance of the results obtained from banding waterfowl at Lara Lake (see *Bird-Banding*, **25**: 17). In 1951, 1952, and 1953 the Department banded 11,620 birds, 8,698 of them Grey Teal *(Anas gibberifrons)* and 2,277 Black Duck *(Anas superciliosa)*. There are good photographs of the banding, and maps showing some of the recoveries.—O. L. Austin, Jr.

CONSERVATION

(See also Numbers 1, 37)

38. The Steller's Albatross of Torishima, A Rediscovery. Masaji Yamamoto. 1954. *Sokkojiho* (Tokyo), **21**(8): 232-233, 1 plate. In Japanese. The author of this most welcome paper is a technician in the Japanese weather service, and not an ornithologist, but he presents the first indisputable evidence in 20 years that Steller's Albatross *(Diomedea albatrus)* is still extant. Though several uncertain sight records have been made since, the last definite record of the species was the 5 birds killed in 1933 at Torishima, a lonely volcanic islet 300 miles due south of Tokyo which was formerly the bird's chief nesting ground. I searched unsuccessfully for it there and in the neighboring Bonins in 1949, and ever since I published my fears that the species was probably extinct *(Pacific Science*, **3**: 283-295), the Japanese weather observers stationed on the island have been watching carefully for it. Now, after an absence of 21 years, it has suddenly reappeared out of the ocean fastnesses, and has bred successfully. Yamamoto's account is accompanied by three clear photographs, one taken 16 January 1954 of a chick in down plumage, one of its parents incubating it, and the third a distant view of the nesting ground with 6 birds present. We will probably never know where the birds have been all this time, but we are certainly glad they are back, and we can be sure that the Japanese authorities will give them the protection they need.—O. L. Austin, Jr.

PLUMAGES AND MOLTS

39. Feather Markings in a Population of Collared Flycatchers. (Gefiedermerkmale bei einer Population des Halsbandschnäppers *(Muscicapa albicollis)*.) Hans Löhrl. 1954. *Bonner Zoologische Beiträge*, **5**(1-2): 33-48. A by-product of the life history study of a population of these birds in the vicinity of Stuttgart, Germany, conducted by means of banding. Changes with age in the amount of white in the plumage are described and tabulated. Wing length averaged 81.4 mm. in 45 yearling males and 83.8 in 80 older males; 79.6 mm. in 12 yearling females, and 81.8 in 83 older females.—M. M. Nice.

FOOD HABITS

40. Food Habits of Wood Pigeon and Stock Dove—observations from a roost near Bonn. (Zur Ernährung von Ringel und Hohltaube Beobachtungen an einem Schlafplatz bei Bonn.) 1954. Günther Niethammer and Wilfried Przygodda. *Die Vogelwelt*, **75**(2): 41-55. Increase in numbers of wintering Wood Pigeons *(Columba palumbus)* is attributed to their ability to shift to a leafy diet in winter. Sixty-one crops collected between January 5 and April 1 are tabulated; 45 of these appear to have contained identifiable food and most contained brussel sprout or clover leaves. Seven crops of Stock Dove *(Columba oenas)* are also tabulated. The data on winter flock composition are too scanty for the conclusions drawn from them.—Frances Hamerstrom.

41. Bird Revival and Food. Lila Lofberg. 1954. *News from the Bird-Banders, Western Bird-Banding Association*, **29**(4): 41-42. Birds stunned by

flying against windows can often be revived by being held in an upsidedown position. Food cakes can be made by mixing baby chick food, table scraps, etc., into melted grease, putting the mixture into milk cartons and refrigerating it.—M. M. Nice.

BOOKS

42. Biographies of Members of the American Ornithologists' Union. T. S. Palmer and Others. Reprinted from 'The Auk' 1884-1954. Edited by Paul H. Oehser. 1954. Lord Baltimore Press. Baltimore, Md. $4.00, paper covers, $5.00, cloth. The preface states that about 1,200 biographies are here reprinted from "The Auk," including "66 nonmembers identified with ornithological work. It does not include 46 biographies published elsewhere. . . . About one-half of the obituaries were contributed by 5 members: J. A. Allen, A. K. Fisher, T. S. Palmer, A. W. Schorger, and Witmer Stone." The accounts differ greatly in length and interest, depending on the writer, on the degree of his acquaintance with and friendship for his subject, and sometimes on the subject's importance to ornithology. A useful feature is the inclusion of biographies of eminent foreign ornithologists as well as of some American nature writers.

Ironically enough it is the Fellows who are slighted. Some are mentioned briefly in editorials that give an idea of the loss sustained by ornithology in their deaths, but include few details as to their lives, nor is there any reference added as to where the memorials are published. Many Fellows—apparently 46—are not cited at all except sometimes incidentally as husbands of their wives, or their names may appear as authors of obituaries of others. It is a shock indeed to find no biography of Florence Merriam Bailey, first woman Fellow of the Union, of Glover M. Allen, Allen Brooks, Frank Chapman, A. K. Fisher, Joseph Grinnell, C. Hart Merriam, Thomas S. Roberts, and Witmer Stone, to mention only a few of the leaders of American ornithology. The 46 eminent and neglected ornithologists should have had at least a few lines dedicated to them, giving an epitome of their work and a reference to the full biography in "The Auk." Despite these most unfortunate omissions, the book should serve as a useful reference work on 1,200 people interested in birds who died during the last 70 years.—M. M. Nice.

43. The Mammal Guide/Mammals of North America north of Mexico. Ralph S. Palmer. 1954. Doubleday & Co., Inc., Garden City, N. Y. pp. 1-384, 40 colored plates, numerous text figures. Price $4.95. And well worth it. This fine piece of work is a *must* for your reference shelf, and for your pocket when you go afield. Dr. Palmer has produced as clear, succinct, simple, readable, complete, and authoritative a guide as has been published for any of our fauna and flora in the spate of pocket guides now available. He has handled the several difficult problems the mammals present for such treatment in a most satisfactory way—such involved and controversial matters as the subspecies problem (few authors today agree on even the specific relationships in many mammals), and that of suitable and acceptable vernacular names for those that have none in common use. Range maps are given for every species, and the volume is well indexed. The publishers have treated the book well. The author's fine colored plates and his many line drawings are excellently reproduced.—O. L. Austin, Jr.

44. The Little Book of the Woods. (Das kleine Waldbuch.) Rolf Dirksen. 1954. C. Bertelsmann. Gütersloh. 32 pp. 2.20 DM. A charming little book describing with feeling the changing beauty of the woods throughout the seasons. A section on the development and history of the forest is followed by descriptions of the chief forest types in Germany: beech woods, mixed woods, spruce, fir, pine and pine-spruce-larch forest of the mountain tops. References are given to seven books on the subject. The 31 photographs show these different forests in many moods and also give a glimpse of the birds and mammals that dwell in the wild woods.—M. M. Nice.

NOTES AND NEWS

Prof. Chapman's paper on Tree Swallows was accepted for publication in June, 1954, with a note added later on the 1954 season. Accordingly, its references to Kent Island birds are necessarily based only on Winn's 1949 paper, and not on Paynter's long paper in *Bird-Banding*, which was not concluded until the October, 1954 issue.

The Northeastern Bird-Banding Association has just put into effect a new class of annual membership, a family membership for adults, with only one copy of each issue of *Bird-Banding* but with each adult a regular member of the association, for $7.

We would like to locate three old issues of *Bird-Banding* for which we have no reserve stock: volume 1, numbers 3 and 4, July and October, 1930; and volume 2, number 1, January 1931. If any reader has these for sale, please inform Mr. William P. Pielou, Dept. of Natural Science, Michigan State College, East Lansing, Mich., stating price and condition.

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